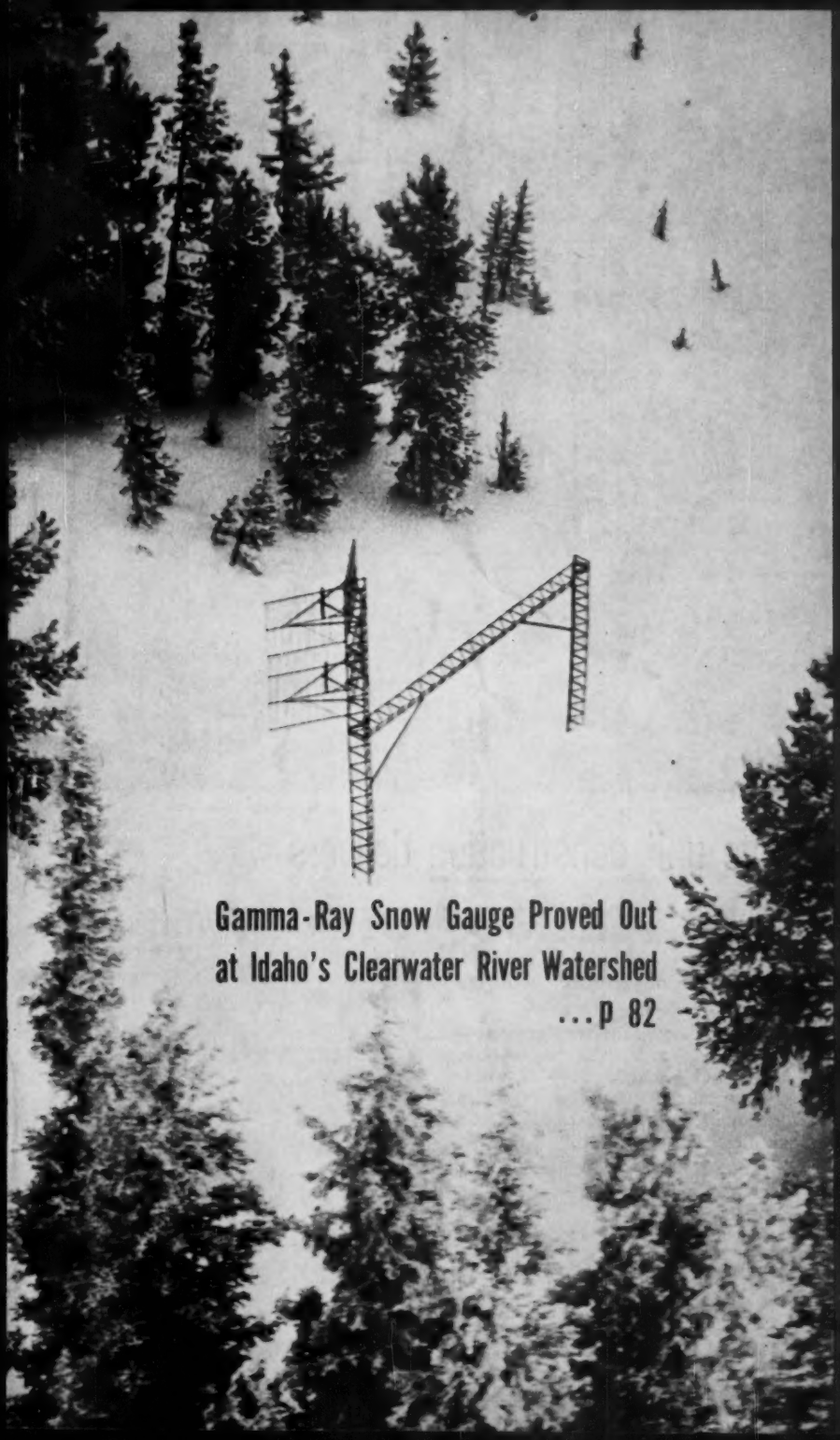
Electrical World



Gamma-Ray Snow Gauge Proved Out at Idaho's Clearwater River Watershed ...p 82

Fifth of Six Reports for 1960

Starts on p 65

Radioactive Tracing ...
Headaches Cured at Western Mass Electric ... 84
Automatic Logger Monitors Gas Turbines at Antioch, Columbia Georgia Plant ... 86

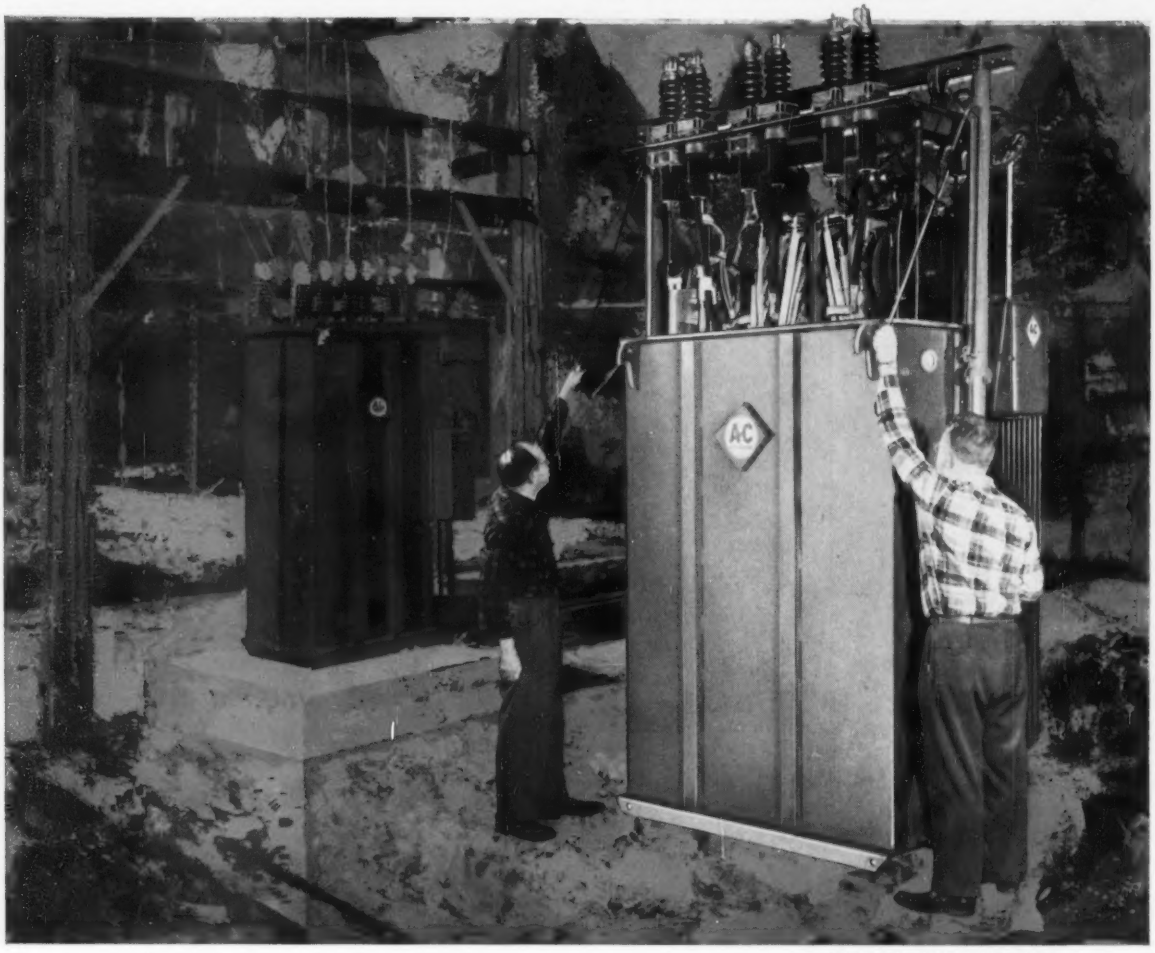
Departments:

Construction ... 90
Operation & Testing ... 94
Maintenance & Repair ... 100
Stores & Shops ... 108
Safety ... 112

UNIV MICROFILMS INC
EDITORIAL DEPT
313 N FIRST ST
ANN ARBOR MICH

ALLIS-CHALMERS

ORIGINATORS OF 5/8% STEP REGULATORS



SFR Feeder Voltage Regulator

Only exclusive unit construction delivers

extra regulator values you can see

Why is unit construction so important to regulator users? Simply because this design is *basic* to these many other extra-value A-C features *you can see*...advantages you can't find on any ordinary regulator!

You'll see continuous leads passing directly from the coils to the double-bolt terminals on the dial switch.

You'll see 78 fewer bolted connections only unit construction can offer. No leads to disconnect, no terminals to remove when you untank.

You'll see better workmanship, since all connections are securely made and double-checked *before* unit is tanked!

You'll see how much easier inspections can be. To untank, remove cover bolts and control compartment retaining nuts. Then lift entire assembly from the tank . . . there's no need to remove oil.

Your nearby A-C office has the facts on single and three-phase sizes from 2,400 to 69,000 volts . . . in ratings up to 2,500 kva. Or write **Allis-Chalmers,** Power Equipment Division, Milwaukee 1, Wisconsin.

A-1379

Caliband is an Allis-Chalmers trademark.

CALIBAND control — At the twist of the control knob, you can set or test voltage level and band width without changing voltage or interrupting regulated service.

Published for 86 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Electrical World

OCTOBER 24, 1960

Vol. 154, No. 17

Electrical What in the World . . .

Whenever a new generating station, a new lab, a new factory, or any new facility the owner considers important is commissioned formally, there's a dedication ceremony. Hordes of people attend; editors are invited. We get lots of invites, and we're always grateful, for ourselves and for our readers.

We don't always go. If we did, we'd do little else but attend dedications. We have to pick and choose, probing for those really significant to our readers.

A dedication ceremony too often is a mere formality, a posted signal that the facility has been in service long enough to be debugged and doing its job. The speakers may say little of interest to our readers. We may be covering the facility in high detail in later engineering features which we hate to upstage unduly. (Here we have to be careful though; sometimes much technical detail is released at the time of the dedication.)

As of right now, a surprisingly large number of really significant dedications are taking place. Within a short interval, we've attended Breed Plant, the biggest, most efficient steam unit; Dresden, the biggest private (and biggest commercial) atomic station; the Cornell EHV Cable Test facility; and the GPU 460-kv test line, just to name a few.

All these represent real milestones in engineering progress. At some of them, the speakers said significant things. These are the kind of dedications we can't afford to miss. When they pile up on top of each other, we're thankful we have a large, well equipped staff to serve you.

Chuck Hochgesang

PUBLISHER *Warren W Shew*

EDITOR *Charles F Hochgesang*

SENIOR EDITORS *Daniel T Braymer* *Leonard M Olmsted* *Jesse A Mock*

MANAGING EDITOR *Herbert R Frankel*

Engineering

SOUTHEASTERN EDITOR *Edward Allen, Atlanta*

MIDWESTERN EDITOR *Francis J Kovalcik, Chicago*

WESTERN EDITOR *Paul H Leech, San Francisco*

NEW ENGLAND EDITOR *Howard S Knowlton, Boston*

MIDDLE EASTERN EDITOR *Leon A Allen, Jr*

NORTHEASTERN EDITOR *Willard L Felsen*

METHODS EDITOR *Michael G McGraw*

ASSOCIATE EDITOR *George Swift*

OVERSEAS CORRESPONDENT *J H M Sykes, London*

CONSULTING EDITOR *Archer E Knowlton*

News

NEWS EDITOR *Dale VanHorn*

ASSOCIATE NEWS EDITOR *Kenneth N McLean*

ASSISTANT EDITOR *John D Damon*

DIR, NEWS BUREAU *John Wilhelm*

MGR, WASHINGTON BUREAU *George B Bryant, Jr*

Manufacturers and Supply

MFRS NEWS EDITOR *Paul F Roman*

ASSISTANT EDITOR *Elizabeth R Parker*

Art & Production

ART DIRECTOR *Frank C Stockman*

ASST ART DIRECTOR *Wayne A Trapp*

ASSISTANT EDITOR *Steven Ludwig*

EDITORIAL ASSISTANT *Earl J Carter*

Special Services

MGR, MARKET RESEARCH *Arthur J Stegeman*

MGR, ECONOMIC SERVICES *Douglas Greenwald*

Advertising

SALES MANAGER *Walter R Klein*

DISTRICT MANAGERS: *E B Sessions, New York; D J Roberts, Boston; E A Martin, Philadelphia; E F Coffey, Jr, Cleveland; E F Coffey, Jr, Detroit; M S Kearney, Pittsburgh; W H Meneilley, J T Schaefer, Chicago; J T Schaefer, St. Louis; Russell Antles, Los Angeles; R C Alcorn, T H Carmody, San Francisco; Robert H Powell, Atlanta; John Grant, Dallas; F E Holland, Houston; John Patten, Denver; Scott Hubbard, Portland, Ore.*

BUSINESS MANAGER *Otto A Drechsel*

ASST BUSINESS MGR *John F Dugan*

PROMOTION MANAGER *Donald K Ellis*

CIRCULATION MANAGER *E Bryson Sessions*

AFTER 30 YEARS ON THE JOB . . . Okolite insulation still looks good. This unretouched photograph shows a section of 11.5 Kv power cable recently re-assigned by Duquesne Light Company. Note that the insulation is still flexible and resilient—workable. Tests made this year show the tensile strength has deteriorated very little, remaining more than 33% above the original specification figure.

30-year-old Okonite cable still tests above specification figures . . .

This is CABLE'BILITY *a new word for your vocabulary*

Cable'bility (cā'ble·bil'·i·ty) *new word. Noun.* **1.** Ability to design and manufacture electrical cables that give outstanding performance. **2.** Having long background and wide experience in cable research and application. **3.** Possessing keen understanding of customers' problems. Implies eagerness to serve faithfully and dedication to progress. **Syn.** The Okonite Company.

This is Okonite Cable'bility at work. It's "Old Faithful"—a 1250 MCM, Okolite-insulated power cable made in 1929, now carrying on a new career as a mine power feeder for Duquesne Light of Pittsburgh.

"Old Faithful" began service as an 11.5 Kv lead from switchyard to transformer, handling 15,000 KVA loads. During World War II, it saw fifteen years of full load operation, 24 hours a day. Then in 1957 it was replaced with a larger cable to handle even greater loads. But it was found still suitable for demanding tasks as a power feeder.

There are Okonite "Old Faithfuls" in use today in every application . . . *yours* too. Because, as in 1929, Okonite still produces the most dependable cables on the market. The reason is Cable'bility. The Okonite Company, Subsidiary of Kennecott Copper Corporation, Passaic, N. J.

***where there's electrical power . . . there's* OKONITE CABLE**

6960-A

Letters

Commends Newsletter on Pricing

To the Editor:

I want to compliment you on the Management Newsletter, particularly the one ("What Can Buyers, Suppliers Do?") in the Sept. 19 issue of *Electrical World*.

I feel that you have done an excellent job of analyzing the manufacturer-purchaser relations, and the problems we are facing. I sincerely hope that this Management Newsletter is widely read, and that your comments and suggestions are seriously taken. I feel you are performing a real service in so clearly defining the problems and offering some good suggestions as to how to improve the situation.

W. B. Freeman, District Manager
Distribution Equipment Sales
General Electric Co.
San Francisco, Calif.

▶Thank you, Reader Freeman. The series of three Management Newsletters on Pricing and the Antitrust Cases carried in the Sept. 5, 12, and 19 issues has brought a wide response. Reprints of this series are available at nominal cost.

Did Not Discuss With Ellis

To the Editor:

Your Sept. 19 issue, p 186, reports that my suggestion for a giant power grid for Alaska was reported by me as having been approved by Clyde Ellis (National Rural Electric Cooperative Assn general manager).

I did not say this nor discuss it with Mr Ellis.

However, the situation has changed with the virtual completion of the Bureau of Reclamation's Susitna River project report calling for the 580,000-kw Devil Canyon Dam plus 230,000-v lines north to Fairbanks and south to Anchorage.

At the Senate Interior hearing at Juneau Sept. 15, I testified in favor of the Bureau plan and urged authorization next year.

Gus Norwood, Executive Secretary
Northwest Public Power Assn
Vancouver, Wash.

Dateline . . .

Louisville—Cooperation between rural electric cooperatives and investor-owned utilities is a growing thing because it is so practical. This doesn't make it any less a bitter pill for many of the oldtimers on both sides. They have fought too long and too well to feel 100% comfortable with the changing scene, but change they must, and change they do.

While at the farm power conference this fall, a roving editor repeatedly introduced the subject in woodshedding sessions. Time after time these words were repeated by co-op men:

- I don't like it personally, but it is the only thing that makes sense.
- When rural territory we serve becomes urban, we have a right to continue to serve it.
- Cooperating with them is our way of keeping them from taking us over.
- We don't want urban load. We didn't start out with it and we couldn't handle it now.
- We need some industrial load to survive.

The utility company men nearly always say the same thing first.

- I don't like it personally, but it is the only thing that makes sense.
- If we don't take care of our own region together, the government will take all of us over—co-ops and companies.
- I think a little fight now and then keeps us on our toes. I'm worried about the younger men in our organization though. They don't know anything but cooperation. We could get too soft.

In a conversation with a cooperative director, a fruit grower, the editor asked: "Do you endorse all of the policies of NRECA?"

The farmer replied, "No. We don't want the government mixed up in our operation any more than necessary. We want the 2% money and the best rates we can get, but we just want to be in our own

(*Continued on page* 43)

ELECTRICAL WORLD
Vol. 154, No. 17 October 24, 1960

Published weekly by McGraw-Hill Publishing Co., Inc., James H. McGraw (1860-1948), Founder. **Executive, Editorial, Circulation and Advertising Offices:** McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y. Printed at 99-129 North Broadway, Albany 1, N. Y. See panel below for information regarding subscriptions or change of address.

Officers of the Publications Division: Nelson L. Bond, President; Shelton Fisher, Wallace E. Truendly, Senior Vice Presidents; John R. Callaham, Vice President and Editorial Director; Joseph H. Allen, Vice President and Director of Advertising Sales; A. R. Venezian, Vice President and Circulation Coordinator. **Officers of the Corporation:** Donald C. McGraw, President; Joseph A. Gerardi, Hugh J. Kelly, Harry L. Waddell, Executive Vice Presidents; L. Keith Goodrich, Vice President and Treasurer; John J. Cooke, Secretary.

Subscriptions are solicited from executive, supervisory, and engineering personnel in electric utilities, manufacturing companies, and related fields; and from consulting engineers and electrical engineers in industry. Position and company connection must be indicated on subscription orders. Send to address shown in box at right.

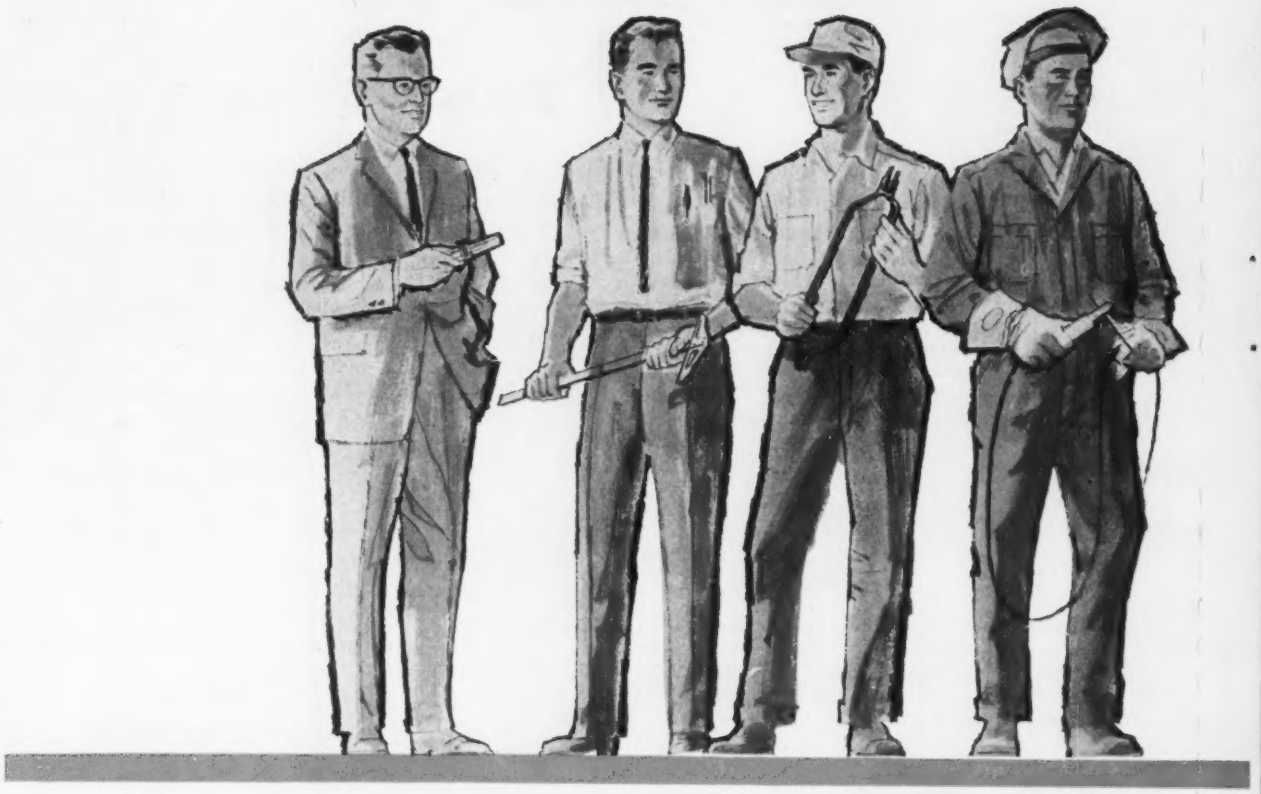
United States and Canada subscription rate for individuals in the field of the publication $6.00 per year; single copies one dollar. Other Western Hemisphere and the Philippines $20.00 payable in advance and other countries $30.00 payable in advance.

Second-class postage paid at Albany, N. Y. Title registered in U. S. Patent Office. Copyright 1960 McGraw-Hill Publishing Company, Inc. All rights reserved. Permission required to reproduce any of contents. Printed in U. S. A.

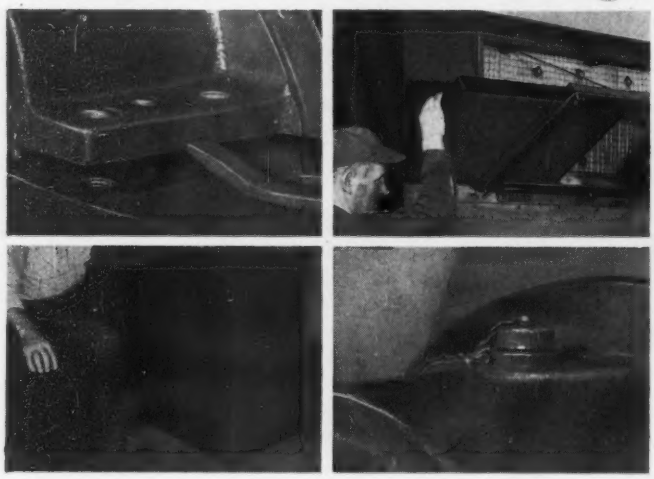
Unconditional guarantee: Our primary aim is to provide subscribers with a useful and valuable publication. Any comments or suggestions for improvement will be most welcome. On written request, from any subscriber, the publisher agrees to refund the unused portion of the subscription price.

SUBSCRIPTION AND ADDRESS CHANGES: Send subscription correspondence and change of address to Fulfillment Manager, ELECTRICAL WORLD, 330 West 42nd Street, New York 36, N. Y. Subscribers should notify Fulfillment Manager promptly of any change of address, giving old as well as new address, and including postal zone number, if any. If possible, enclose an address label from a recent issue of the magazine. Please allow one month for change to become effective.

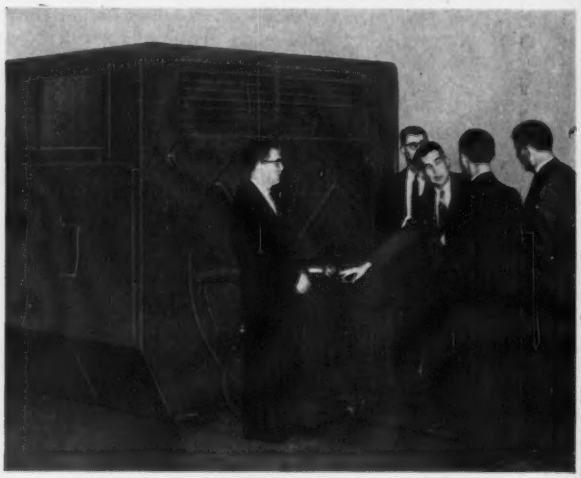
Postmaster . . . Please send form 3579 to Electrical World, 330 W. 42nd St., New York 36, N. Y.



Here's a record of design features developed



Flexibility in "little things" (above) include: a chamfer, which simplifies bearing cap removal; an air filter which is easier to replace; optional oversize conduit boxes; a chained, tapered oil-ring inspection plug.



A boon to boiler-room attendants and to neighbors of power stations is the super-quiet boiler feed pump motor pioneered by Elliott in 1954. The largest motors of this type in service are Elliott.

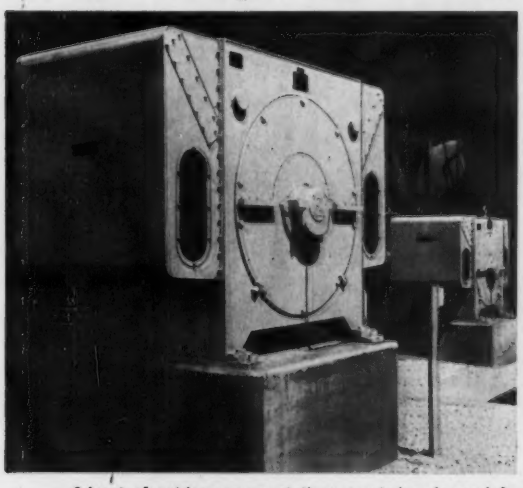
READY, ABLE & WILLING

—if you'll let us!

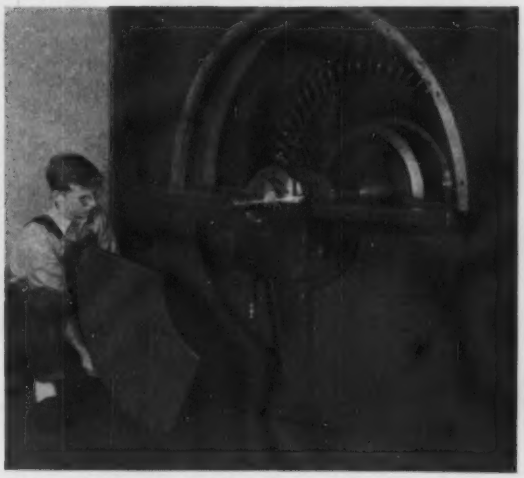
Open-mindedness is an Elliott characteristic that motor buyers like. Traditionally, Elliott has had a willingness to accept new ideas, the ability to translate user's needs into motor designs, the facilities to produce large motors of highest quality. The entire Elliott engineering and production staff—from application engineer to expediter—is organized to carry out this policy.

Some of the design features developed at the suggestion of utility engineers are briefly described below. Other basic Elliott developments include FABRI-STEEL welded frame construction, and the record-shattering FABRI-SEAL insulation system for motor coils. These and other Elliott features are responsible for the solid record of outstanding performance in hundreds of utility powerhouses throughout the United States.

in cooperation with utility engineers



Advent of outdoor power stations created a demand for an "outdoor" type motor. Elliott was the first to produce a weather-protected motor, and in the process, developed the famous FABRI-SEAL insulation system which has set the pace for the industry.

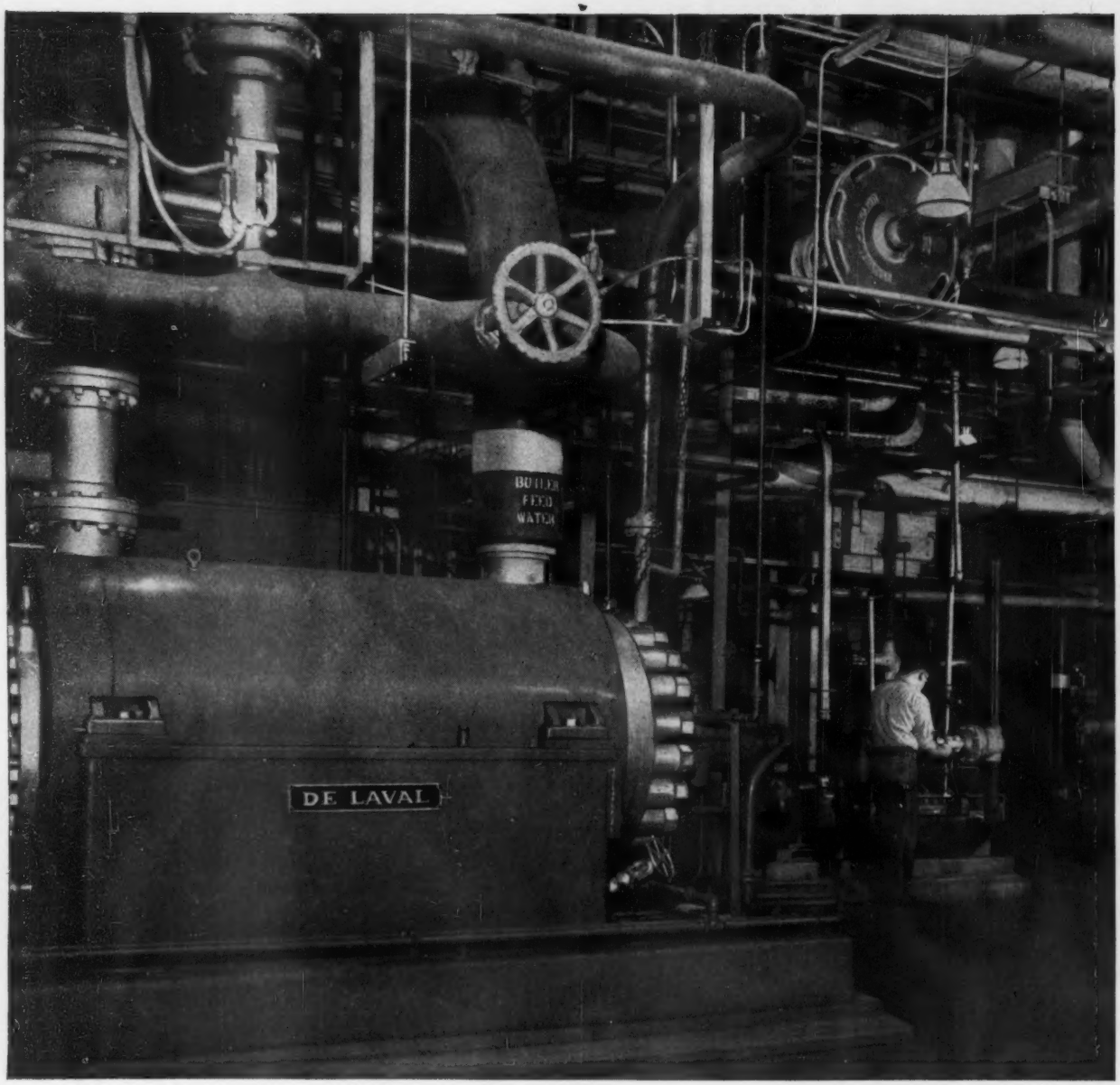


Maintenance requirements of a midwest utility made "easy access" necessary; Elliott ingenuity and flexibility made it possible. The result—easier, faster inspection and cleaning of large motors.

RO-8

ELLIOTT Company
RIDGWAY PLANT, RIDGWAY, PA.

DE LAVAL Boiler Feed Pumps part of modernization



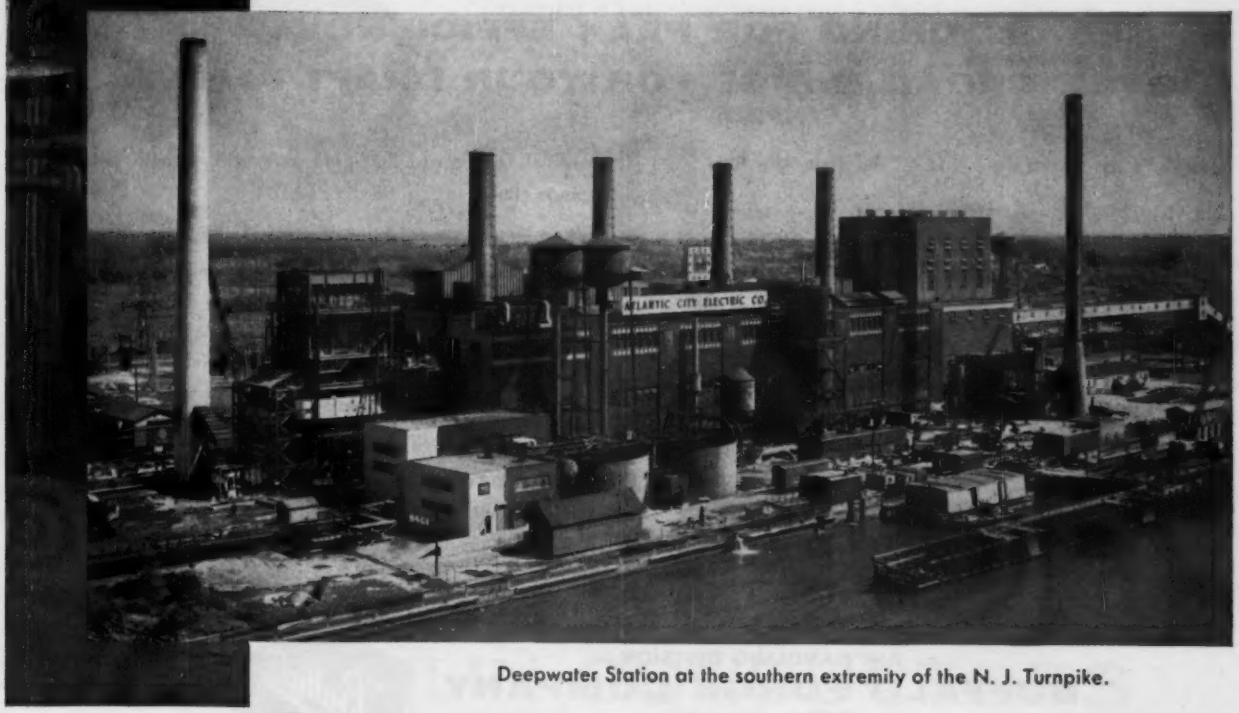
Each De Laval pump has intermediate pressure bleed off for use in controlling steam temperature from reheater.

at Atlantic City Electric

Gibbs & Hill, Inc., Consulting Engineers, handled project for new 79,000 KW unit

To meet increased load demand while improving station performance, Atlantic City Electric has completed the installation of a new 79,000 KW No. 1 main unit at Deepwater Station, the largest now operating in their system.

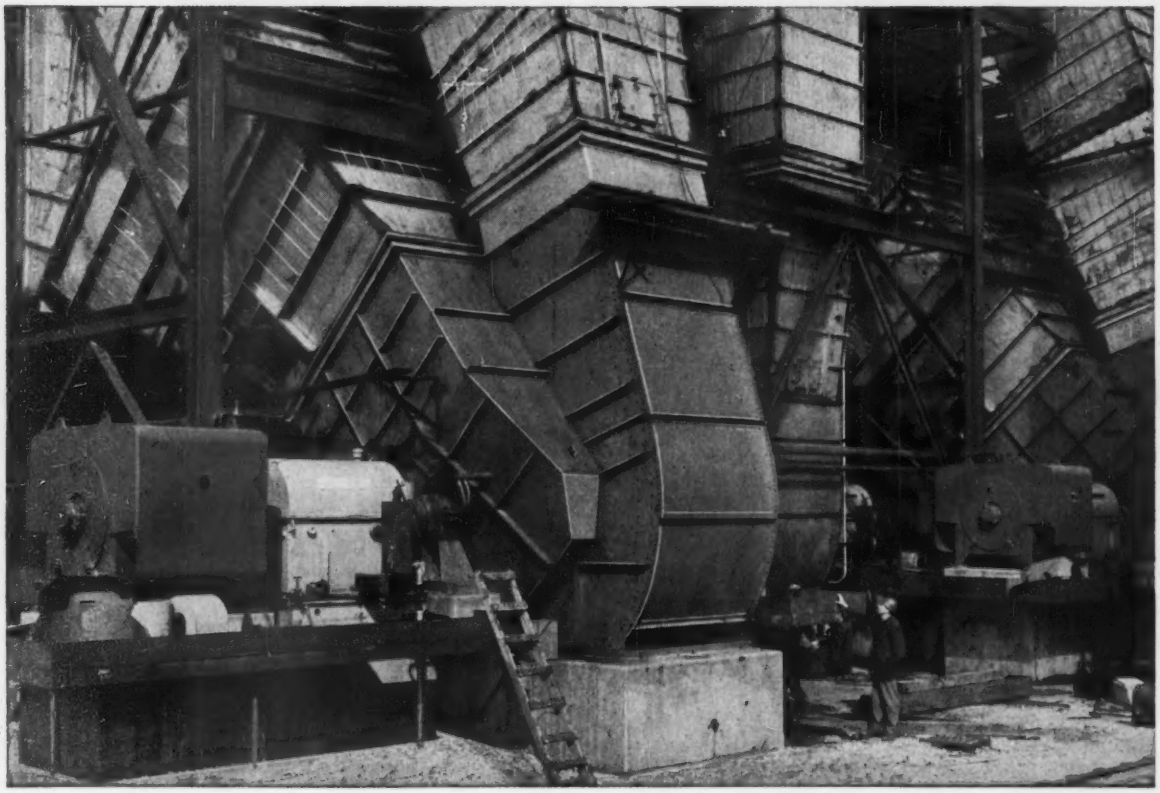
Providing dependable boiler feed service are two 1000 HP direct motor driven half capacity De Laval barrel feed pumps, now in their second year of operation. This is the second modern installation at Deepwater to be served by De Laval barrel pumps.



Deepwater Station at the southern extremity of the N. J. Turnpike.

DE LAVAL STEAM TURBINE COMPANY
861 NOTTINGHAM WAY, TRENTON 2, N. J.

DL 214



LOOKING FOR PEAK EFFICIENCY OVER BROAD RANGE FOR YOUR DRAFT FANS?

Here's Why "Buffalo" "BLH" is Best Answer:

The "Buffalo" Family of "BLH" Fans is designed for highest mechanical efficiency over an extremely broad operating range. Rugged "Buffalo" construction insures economical, dependable operation throughout a long, trouble-free life.

"Buffalo" Type "BLH" features include: streamlined housing designed to deliver ultra-smooth air flow, peak static conversion and pressure distribution at outlet — turbulence minimized by smooth inlet bell, directional inlet vanes, backward-curved blades, matching rotor flange and inlet bell and gradually divergent outlet. These features all add up to the quiet, powerful, smooth performance characteristic of the "BLH".

Reliable, maintenance-free operation is the result of extra-heavy construction throughout. This includes sturdy steel plate construction ruggedly welded for extra strength — oversized shafts and bearings. Rotors are statically and dynamically machine balanced at factory.

If your mechanical draft conditions require a dependable fan that provides high efficiency over a broad operating range, ask your "Buffalo" engineering representative for complete facts about the "Buffalo" family of mechanical draft fans. Or you can write us direct for Bulletin FD-905.

AIR HANDLING DIVISION
BUFFALO FORGE COMPANY
Buffalo, New York
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo"

'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.

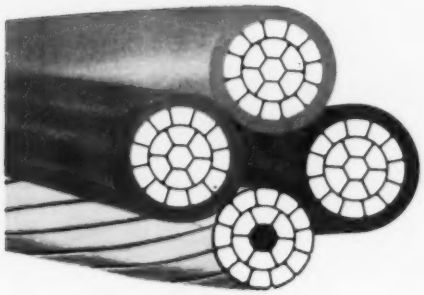
'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

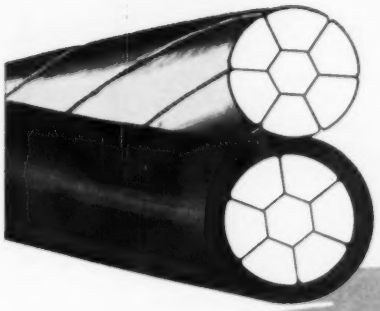
COLOR EVOLUTION

Triplex Secondaries by **SOUTHERN ELECTRICAL** Take on Lasting Color With **HYPALON**®*



COLOR-CODED CABLES Insulated With HYPALON® Have These Major Advantages:

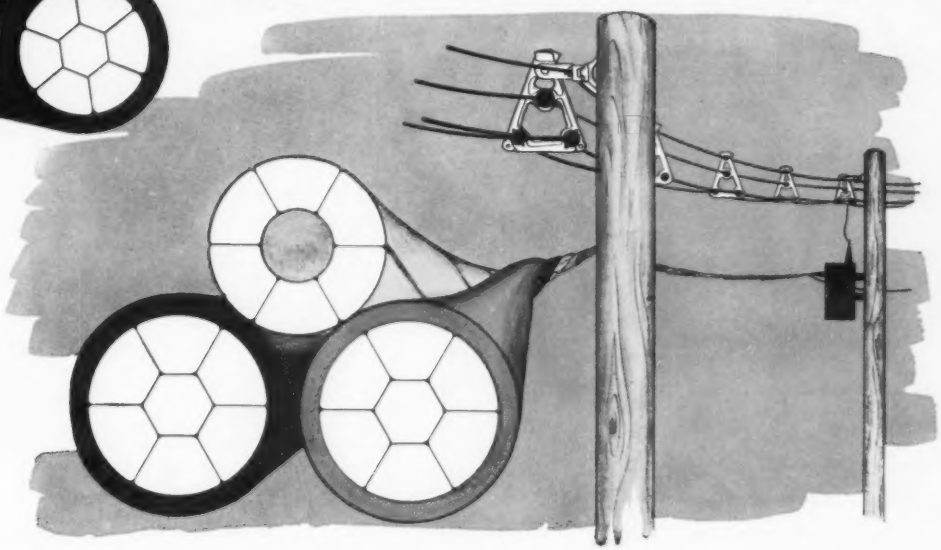
- Positive phase identification, permitting load balancing;
- Available in black, electrical red and electrical grey;
- Outstanding resistance to ozone;
- Excellent resistance to heat, chemicals, flame;
- Improved resistance to compression cutting when used on COMPRESTO®
- HYPALON® can be stripped freely at field temperatures;
- Electrical properties of HYPALON® permit its being rated as a 600-volt class multiplex cable.



*Synthetic rubber covering with properties that exceed Two-Coat coverings for service drop cables.

Hypalon® is a registered trademark of E. I. du Pont de Nemours & Co., Inc.

Compresto® is a registered trademark of Southern Electrical Company.



OLIN CONDUCTORS

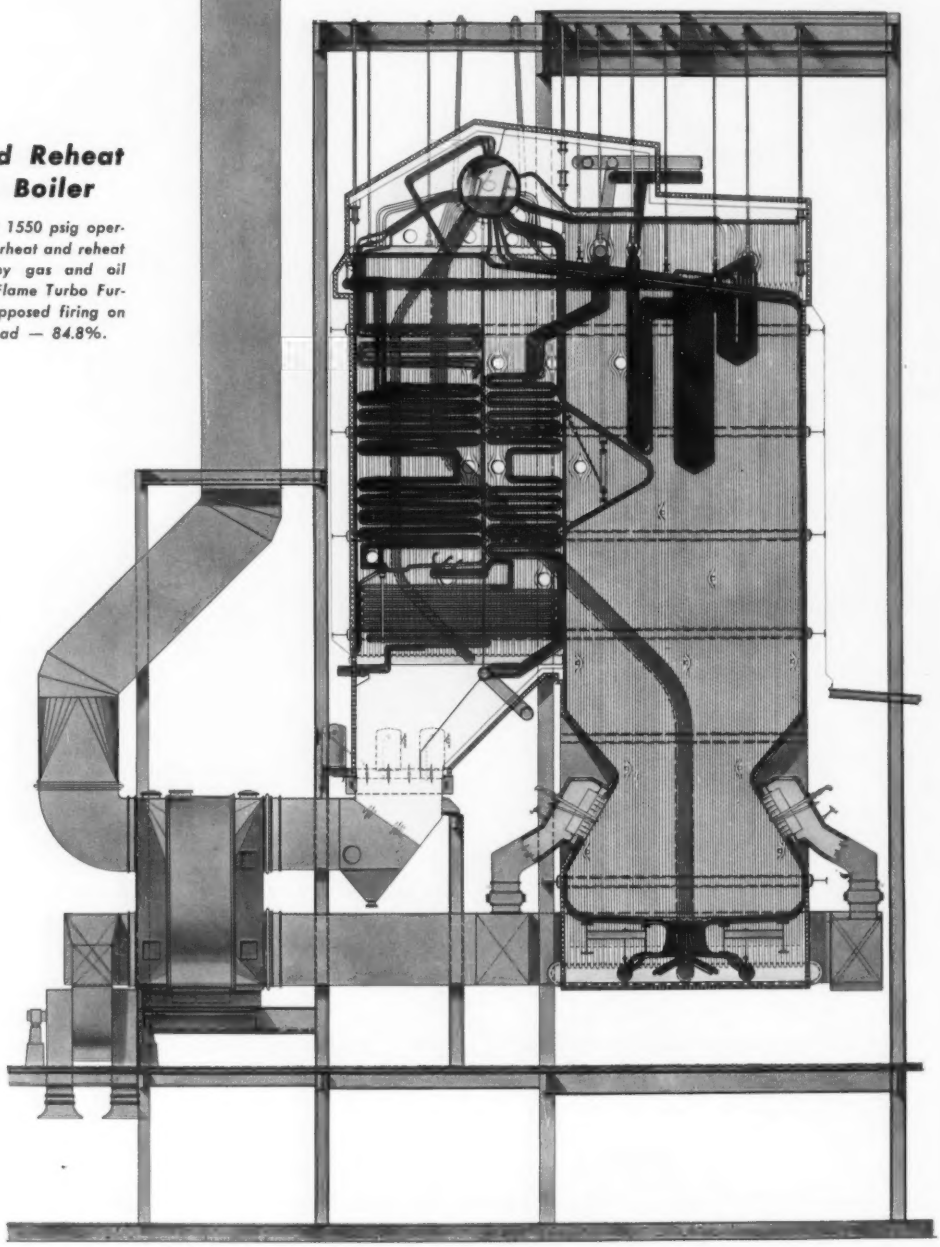
METALS DIVISION **Olin** Electrical Conductor Sales • Chattanooga, Tennessee

Located In the Great Permian Basin Area of West Texas

This Riley TURBO FURNACE Boiler can be converted quickly to coal

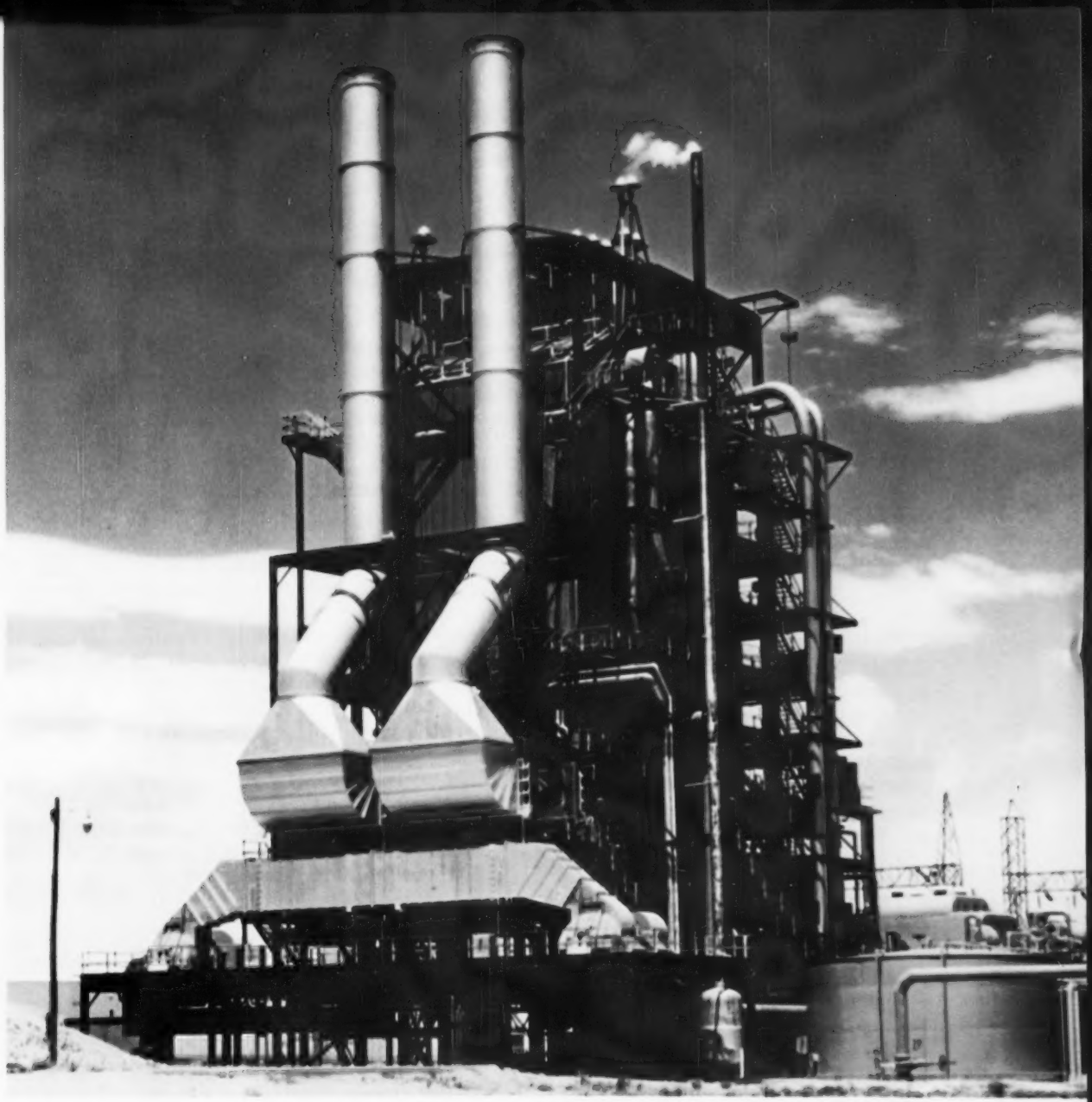
Riley Pressurized Reheat Turbo Furnace Boiler

Capacity — 825,000 lbs/hr at 1550 psig operating pressure and 1005F superheat and reheat steam temperatures. Fired by gas and oil through 12 Riley Directional Flame Turbo Furnace Burners positioned for opposed firing on one level. Efficiency at full load — 84.8%.



Ask your Riley representative for detailed information about Riley Turbo Furnace Boilers — or write direct to RILEY STOKER CORPORATION, WORCESTER, MASSACHUSETTS.

Sales Offices: Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Jacksonville, Kansas City, Los Angeles New Orleans, New York, Philadelphia Pittsburgh, Portland, Salt Lake City, San Francisco, Seattle, St. Louis, St. Paul, Syracuse.



Burning gas and oil now, it may someday become both practical and economical for Texas Electric Service Company to fire its new Riley Turbo Furnace Boiler at Permian Basin Steam Electric Station, Monahans, Texas, with coal.

Because of the Turbo Furnace's unique multifuel characteristics this unit can be quickly and inexpensively converted to coal firing: combustion of coal, oil and gas produces substantially equal furnace performance with equivalent furnace exit temperatures simplifying steam temperature control changes; in addition the ability of the Turbo Furnace to stay clean and slag-free eliminates the need for slag-blowing equipment and sustains an efficient furnace performance indefinitely.

A careful survey of your plant by a qualified consulting engineer could show ways of making substantial savings in power costs.

RILEY

STEAM GENERATING & FUEL BURNING EQUIPMENT

(Advertisement)

SOME STRAIGHT FACTS ON OVERLOAD CAPABILITY

A Frank Statement About Current Announcements on Overload Capability, by R. D. Nelson, President of RT&E Corporation

During the past several months, distribution transformer marketing has been clouded by two so-called "new features" — (1) overload capability and (2) high temperature insulation.

At RT&E, we believe that multiple ratings and 55°C-65°C rise have done a great disservice to the industry by creating an impractical "double standard" that serves only to confuse transformer buying and application.

This "double standard" has resulted in claimed increased capabilities of varying amounts, some by 12%, some by 15% and others by 20%. To the utility engineer these multiple KVA ratings and 55°C-65°C temperature rise mean that each new transformer purchased must be treated apart from other makes and vintages already installed. This, we feel, makes for an impossible situation which instead of alleviating, greatly complicates an already growing utility problem of inventory control.

We believe in new development too, but we also believe that transformer engineering and design should be aimed at what the *customer* really wants: transformers that are smaller in size and at reduced costs.

Here at RT&E overload capability *is* important and necessary . . . *not as an end in itself* . . . but only as a step toward future design and manufacture of smaller transformers at lower costs. Mutiple ratings are not a step in this direction.

Two developments — wound core construction and high temperature RTEX insulation — were key factors in RT&E's pioneering in overload capability, with the result that SINCE MAY 1, 1954, ALL RT&E DISTRIBUTION TRANSFORMERS HAVE HAD 15% OR MORE OVERLOAD CAPABILITY.

Field proof of high overload capability and high temperature insulation built into RT&E transformers the past six years, while rewarding to all of us at RT&E, has not completely satisfied us. In addition to in-service field testing, we have been participating in thermal evaluation tests. These accelerated tests have subjected transformers to extreme overload conditions followed by short circuit and then tests of lightning impulse, high potential, and over excitation. During two years of continuous testing RT&E transformers refused to fail, and were finally taken from the test line.

Yes, RT&E transformers have overload capability and high temperature insulation . . . and have had these "new features" since 1954. However, we will not multiple-rate transformers, nor will we merchandise 65°C rise until it is adequately defined and formally standardized. In the meantime, customers can be sure that all RT&E transformers, both pole type and Terra-Tran, have overload capabilities equal to or greater than any other transformer rated at 55°C-65°C.

Most important to us is the basic premise foremost in our philosophy— RT&E engineering concentration on a single idea to give our customers what they want and need . . . *better transformers that are smaller in size and at reduced costs.* VV

RT&E Corporation • **Waukesha, Wisconsin** • **Portland, Oregon** • **Arlington, Texas**

Electrical World

OCTOBER 24, 1960

Vol. 154, No. 17

Preview of the Issue

DEPARTMENTS

Editorial Comment	37
What in the World	3
Letters	5
Dateline	5
Late News	16
Supply Lines	17
News Scope	43
Manufacturers News	62
EUM	65
New Equipment	67
Manufacturers Literature	116
Selling	35
Management Newsletter	139
News About People	148
Meetings Calendar	158
Advertising Index	158

● **460-KV LINE ENERGIZED IN PENNSYLVANIA indicates in preliminary operation that it can safely carry up to 505 kv. Line will undergo stress, behavior effectiveness, and cost of design tests for two years** 44

● **CYLINDER CRACKING in older turbines is increasing following their transfer from base-load to cyclic operation** 46

● **ELECTRIC UTILITY METHODS REPORT beginning on page 65 features:**

Mountain Gamma Ray snow gauge system telemeters data to base station for flood prediction and improved reservoir management of Idaho's Clearwater River Watershed 82

Shop-field tester resolves oil circuit recloser testing problems 84

Data logger rides herd on gas turbines to reduce manpower requirements at British Columbia's Georgia Generating Plant 86

CURRENT EVENTS

OUTDOING DEMOCRATIC PLATFORM, advisory group urges greater federal role in atomic energy development, overhaul of power policies . . . AEC fails to reconcile GE—Allis-Chalmers differences over Los Angeles reactor contract 38

DATELINE

COOPERATION between rural electric co-ops and investor-owned utilities is growing—a close-up on powermen's views of the changing scene 5

FOREIGN

BRITISH ELECTRICITY COST is rising but the chairman of the CEGB tells EW's foreign correspondent how greater increases were avoided 42

MANAGEMENT

NEW APPROACH TO PRODUCTIVITY: Industry takes a second look at supervisory methods, through its employees' eyes, to find better motivation methods 139

PURCHASING: Utility procurement responsibilities shift with turnkey contract . . . Copper price drop fails to spur buying . . . Inventory trimming still in style 17

MANUFACTURERS NEWS

REGENERATIVE FUEL CELL with improved efficiency is introduced in lightweight, experimental model . . . Utilities tend to order bushing-mounted load tap changers equipment, GE claims .. 62

MEETINGS

UNITED INDUSTRY ACTION is needed to prevent nationalization, American Economic Foundation speaker asserts at PIP meeting in New Orleans 40

PRIMARY PROBLEM of investor-owned utilities is government competition subsidized through tax exemption, Rocky Mountain Electrical League is told 50

POLITICALLY-CHARGED meeting of PEA: Democratic Gov Lawrence declares some federal aid is needed in Pennsylvania—but no hand-outs—while GOP Congressman Saylor warns that federal encroachment trend continues 51

POLITICAL

WHO IS THE GREATER FRIEND TO TVA? That's the public power issue in Kentucky's Senatorial race where each candidate claims more pro-TVA action than the other 43

SELLING

WANTED: MARKETING BASICS FOR HOME LIGHTING. Complex market with few definite results, unaggressive promotion have been hamstringing residential lighting potential 135

LATE NEWS ▶ **Basic US-Canada agreement on upper Columbia River** development includes the following: Canada will build High Arrow ($71.8 million), Duncan Lakes ($25.6 million), Mica Creek ($247.2 million), and $49.7 million of transmission by 1970. Canada will also provide 15.5 million acre-ft of storage for US generation and flood control—8.5 million of it within five years of treaty.

US will build Libby Dam ($322.9 million), $106.4 million of transmission by 1970, and $140.5 million by 1985. US will add $23.7 million generation at existing dams by 1970, and $293.1 million by 1985. US will get all 544 Mw from Libby Dam, 645 Mw of prime power from High Arrow (Canada gets 484 Mw), 138 Mw from Duncan Lakes (Can., 75 Mw) 359 Mw from Mica Creek (Can., 204 Mw).

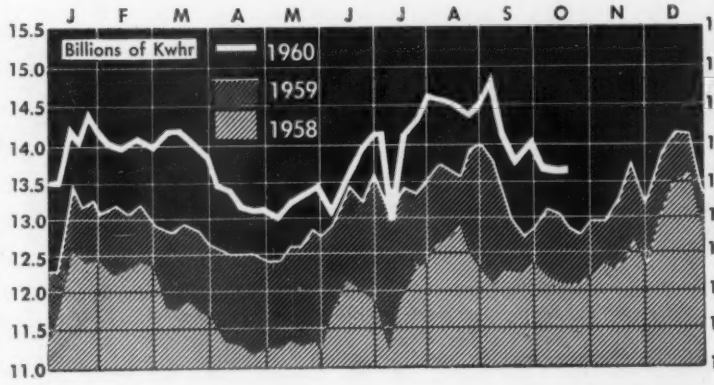
US will provide BPA grid as standby for Canadian east-west use. Canada will pay $1.50 yearly for each kw of dependable capacity US makes available. US will pay Canada for half its added flood control benefits and give Canada half its added power benefits. US has 5-year option to build Libby Dam—not above 2,459-ft normal pool elevation. After 20 years, Canada may divert 1.5 million acre-ft from Kootenay. Fast ratification of treaty, not yet written, is expected.

Philadelphia Electric gets clean bill of health from Pennsylvania PUC in Commission announcement that current rate structure is not producing excessive earnings. Report shows net of $50,012,000 for year ending last March 31, representing slightly under 6% return . . . Con Edison asks NYPSC to grant it a record interim increase in electric rates to restore "extremely unsatisfactory" earnings. Left to the PSC was the amount of increase and who it would be applied to.

Construction on longest 345-kv line in US, 310 miles from Four Corners, N. M. to Phoenix, Ariz., will be started early in 1961, says Arizona PS President Lucking. Total cost of line and switching stations will be $46 million. Two 345-kv lines, costing $20 million, runs 160 miles from Four Corners. Cholla plant near Joseph City, Ariz. Single line continues 150 miles to Phoenix.

Interstate Commerce Commission refuses to upset 50¢ per ton cut in rail freight rates for hauling coal from Appalachian area to East Coast utility. Rate allows coal to be laid down in New York harbor for about $9.28 per ton. Coal men defended cuts, fearing that residual oil from imported fuel would lure away East Coast utility market. ICC ruled that threat of major market loss for coal industry over-rode oil jobber's arguments of discriminatory rates and possible violations of ICC regulations and anti-trust laws.

WEEKLY POWER OUTPUT—Up 6.8% (Week ending Oct. 15), Kwhr 13,736,000,000



Per Cent Change From Previous Year

	Oct. 1	Oct. 8	Oct. 15
Total U. S.	+ 4.1	+ 4.9	+ 6.8
New Eng.	+ 1.5	+ 2.4	+ 3.0
Mid. Atlan.	+ 0.1	− 1.3	+ 4.1
Cent. Indust.	+ 6.2	+ 5.2	+ 6.8
West Cent.	+ 8.2	+ 7.8	+ 8.1
Southeast	+ 1.7	+ 2.8	+ 4.7
South Cent.	− 5.4	+ 7.7	+ 9.8
Rocky Mount.	+15.1	+17.2	+14.9
Pacific			
NW	+ 7.2	+ 5.0	+11.3
SW	+15.0	+11.9	+ 8.2

Seasonally Adjusted Index 269.7

Week Ago 265.7 Year Ago 256.4

Source: Edison Electric Institute

Supply Lines

BUYING RESPONSIBILITIES SHIFT UNDER TURNKEY CONTRACT

Purchasing responsibilities have been assigned under the turnkey contract by which General Electric Co will furnish and build a 200-plus-Mw combined gas-steam turbine generating unit for Oklahoma Gas & Electric Co. This is believed to be the first time in recent years a large electrical manufacturing firm has taken such a role for a major domestic generating plant outside the nuclear field. However, reports are that Texas Electric Service Co is still considering a similar contract for a conventional steam generating plant.

Under the GE-OG&E contract, GE will purchase all material and equipment that will become a permanent part of the completed installation. The manufacturer will call on the OG&E Purchasing Department to assist in those purchases by procuring certain materials and equipment that can best be obtained in the local service area. The utility Purchasing Department will have liaison with the GE project manager and will have several engineers, buyers, and stores people working with the project manager's staff.

OG&E will purchase all materials and equipment classified as temporary that will be used for the construction of the unit. This includes such materials as form lumber, scaffolding, construction shacks, temporary pipe, and steel framework.

What does the OG&E Purchasing Department think of the arrangement? Purchasing Agent Bruce Spence told *Electrical World*, "We feel that the purchasing arrangements that have been worked out are infinitely better than they would have been if we had engaged an outside construction firm to do the job. This is particularly true since all of the erection and construction labor for the entire project, including supervision of the erection and construction forces, will be performed by OG&E personnel.

Real significance of these arrangements are that they set a precedent for future turnkey contracts on non-nuclear generating units. The turnkey contract appears to be an integral part of the Powercasting concept advanced by Westinghouse Electric Corp, and may gain other adherents if Texas Electric Service finally works out a contract. The role and the experiences of purchasing departments under these as well as under the nuclear plant contracts would provide useful guidance if these few experiments turn into a trend toward turnkey contracts.

COPPER PRICE DIP HAS NO EFFECT ON WIRE AND CABLE ORDERS

The three-cent cut in copper prices has brought no perceptible response in the wire and cable market, wire mills reported last week. With the exception of a few heavily insulated conductors, the copper price reduction was passed directly along to the buyers of wire and cable. But this brought no immediate spurt of buying despite the low inventories being kept by electrical equipment manufacturers and utilities. In one case, a wire and cable sales executive reported that delivery time had been cut as short as two hours for some customers drawing from warehouses.

One supplier summed up the situation this way: "Buyers seem to feel that they have little to gain by buying ahead following a price decrease. They buy as they need and get the price in effect at time of delivery."

The copper price drop had come months later than was expected by many in the industry. McGraw-Hill Engineering and Mining Journal's weekly market report,

for instance, had forecast that copper prices for the year would average around 30¢ per lb. Yet the price remained stable at 33¢ until the Oct. 12 cut.

FURTHER PRICE REDUCTIONS ANNOUNCED

Net price reductions of approximately 10% on "indoor and outdoor metal-clad switchgear and low-voltage metal-enclosed switchgear" were announced earlier this month by Westinghouse Electric Corp. Westinghouse said the new prices, which include a number of minor corrective adjustments, are now in the hands of customers.

Earlier in the month General Electric Co reduced prices on high-voltage distribution transformers, 22 through 69 kv, up to 500 kva from 4% to 20.5%. As an example of the new prices, GE noted that a transformer rated 333 kva, 43,800 v which formerly sold for $3,726 is now $3,297. W. R. Smart, marketing manager of GE's Distribution Transformer Department, said "This price reduction covers ratings which were not included in the July 16 'preferred rating' price change. In the case of some of the higher ratings it is also an adjustment of published prices to current market levels."

INVENTORIES COULD GO LOWER; EXPEDITING GAINS

A number of utilities have been trimming inventory in an orderly manner for a year or longer and expect to cut still further. A Midwest utility reports that stocks are near a post World War II low, and a large Eastern utility notes that its stocks are down at least 10% from 18 months ago. Both look for further orderly trimming. An inventory formula designed to key stocks to usage appears to be gaining attention from several utilities.

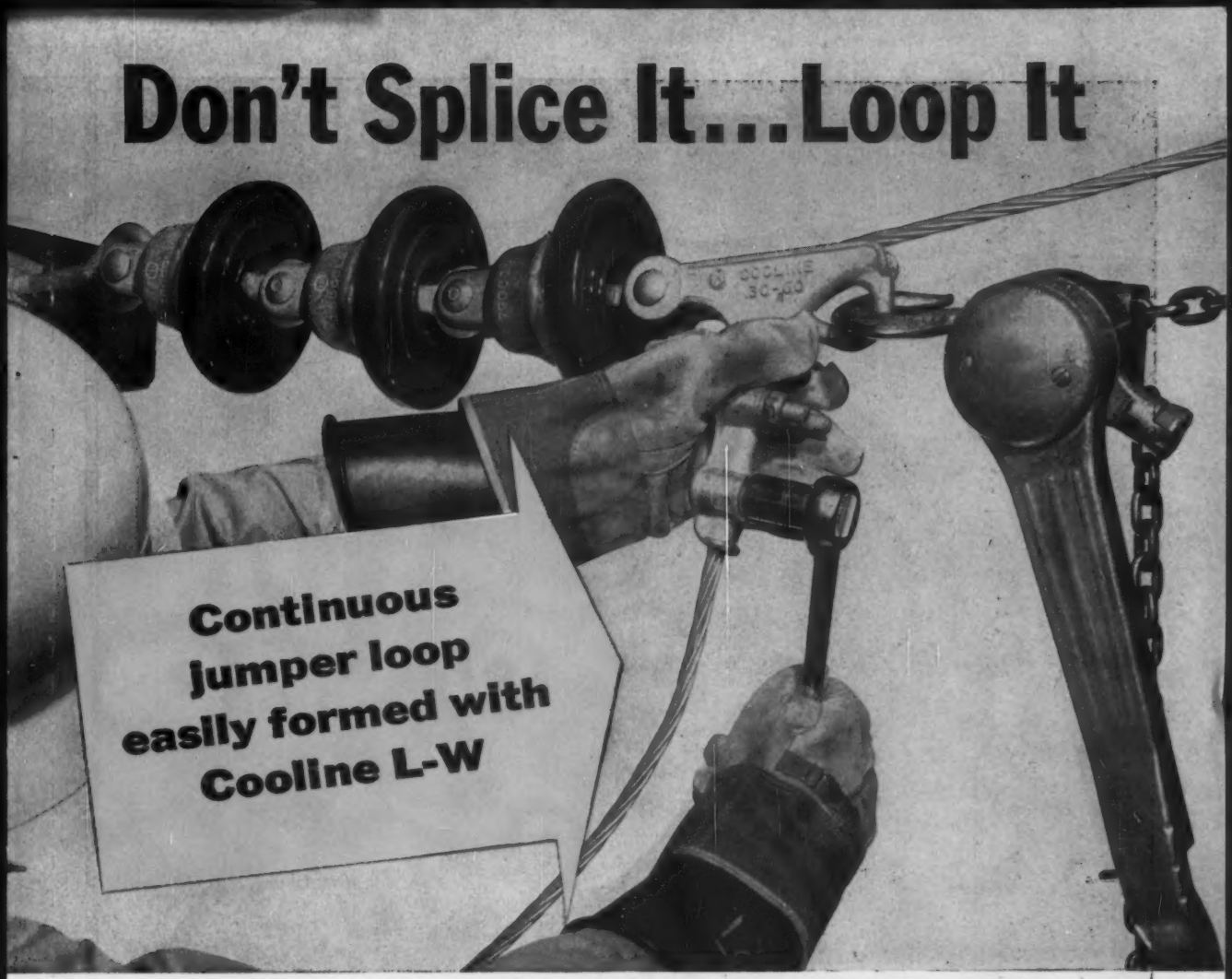
But inventory trimming is not across-the-board. One large East Coast utility notes that a heavy construction schedule has actually pushed its stocks considerably above a year ago.

Another aspect of the utility inventory picture is that in some instances it has increased the work of expeditors. One utility reports that it has stepped up expediting in the past two months and asserts that suppliers have been trimming stocks at the same time utilities have been trimming their inventories. This utility is keeping tabs on suppliers, occasionally sending out inspectors to make sure that suppliers maintain stocks as specified in blanket orders.

BREAK IN GE STRIKE MAY EASE CONCERN OVER UNITS

Return of workers to General Electric Co's turbine and generator plants at Schenectady eased some of the concern of utilities that specific large units might be delayed by the IUE strike. There appeared to be some sentiment for a back-to-work movement by members of the Pittsfield (Mass.) local. The Pittsfield plants manufacture large and medium power transformers. At a meeting in New York, members of the IUE conference board gave IUE Pres James M. Carey a vote of confidence by empowering the negotiating committee to work out a final agreement with GE. The conference board is scheduled to meet again this week to hear reports from the negotiating committee and to consider plans for future action. Meanwhile GE stuck to its previous offer.

Don't Splice It...Loop It



When Cooline L-W clamps are used on distribution deadends, trouble-free jumper loops can be formed quickly, efficiently without cutting or splicing the conductor.

Low-cost Cooline L-W clamps offer many of the advantages of heavy duty Cooline clamps for transmission lines, but are especially designed for the distribution and sub-transmission trend toward larger conductors and shorter spans.

The L-W clamp has a powerful snubbing action which has high holding power without crushing the conductor. The six models in the series cover a range from .2 to 1.3 inches in conductor diameter with more than adequate ultimate strengths.

Installation is simple since no special tools or skills are required. A few minutes with a standard wrench and Cooline L-W clamps are ready to serve the life of the line.

Just look at these many advantages: design that permits the use of continuous jumper loop without splicing conductor . . . convenience . . . high, maintained holding power . . . low installed cost. And the aluminum construction minimizes electrical losses and conductor heating.

It's certainly worth your time to investigate the many advantages of Cooline L-W clamps now.

This product distributed by GraybaR ELECTRIC COMPANY

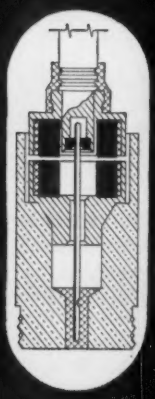
OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

10038-H



RESEARCH ADVANCES METERING ART... ARE YOU GETTING THE BENEFITS?

Not sure? Then why not investigate MAGNETHRUST*, the result of a 72-year search for a perfect meter bearing.

In the revolutionary MAGNETHRUST bearing system, disc and shaft float on a magnetic field produced by two small magnets made of barium ferrite . . . the most stable magnetic material ever used in a magnetic bearing system.

Barium ferrite bearings are tamperproof . . . can't be demagnetized by external magnet or surge current, include lightning. High ambient temperatures won't affect them, either.

Westinghouse guarantees MAGNETHRUST meters for 30 years . . . your assurance of top operating performance and revenue protection.

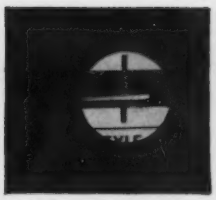
Your Westinghouse representative has more facts, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. *You can be sure . . . if it's Westinghouse.*

J-40535

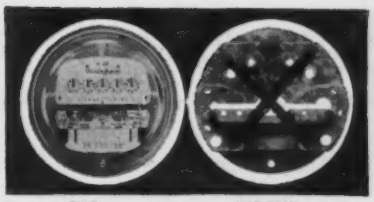
*Trade-Mark

Westinghouse

TINY, HIGHLY STABLE MAGNETS in remarkable MAGNETHRUST bearing system repel each other, causing disc and shaft to ride on a magnetic, non-wearing cushion.



CODED NAMEPLATE: Eliminates the possibility of installing a register with an incorrect ratio . . . vertical alignment of the two lines assures you at a glance that you have the right combination.

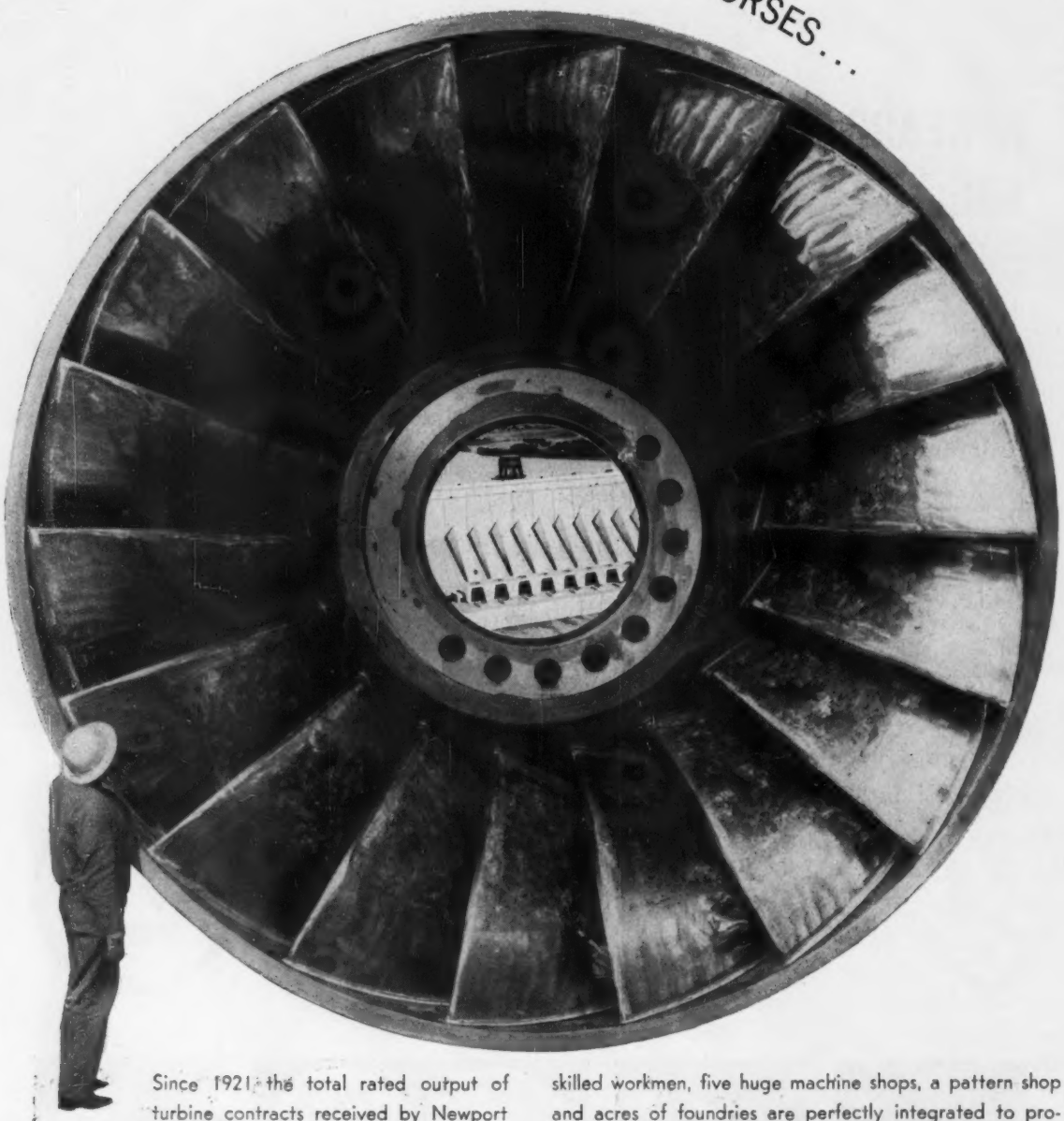


THIS NOT THIS

COMPLETELY CORROSION PROTECTED—All 250 parts protectively coated to give you the greatest corrosion protection. A major factor in the life of a meter.

SUPERIOR LIGHTNING PROTECTION—Exclusive De-ion® arrester gaps carry lightning surges safely from the meter and expel arc and surge outside of the meter.

NEWPORT NEWS HARNESSES 12,000,000 HORSES...



Since 1921 the total rated output of turbine contracts received by Newport News exceeds 12,000,000 horsepower. The Niagara Project, Grand Coulee, Hoover and Chief Joseph are but a few of the installations for which Newport News has designed and built such equipment as hydraulic turbines, valves, gates and penstocks.

Newport News has the men . . . the methods . . . and the machines to take gigantic jobs like these in stride. Large engineering and design staffs, hundreds of highly skilled workmen, five huge machine shops, a pattern shop and acres of foundries are perfectly integrated to produce large units in the shortest possible time . . . from water power equipment to wind tunnels, from cracking towers to paper dryer rolls.

Look to Newport News with its seventy-five years of metal fabricating experience. Your inquiries are invited.

Newport News
SHIPBUILDING AND DRY DOCK CO.
NEWPORT NEWS, VIRGINIA

WHERE DO YOU STAND ON COMPUTER CONTROL— LEADING OR LAGGING?

Far-sighted leaders in industry are realizing the benefits made possible by applying computer control systems to their processes.

Working with these leaders, General Electric has already pioneered the application of twenty on-line GE-312 computer systems now being implemented in these basic areas —STEEL, ELECTRIC UTILITIES, CHEMICAL, CEMENT, and PRODUCTION CONTROL for various manufacturing applications.

The GE-312 Computer Control System embodies adaptability and flexibility to meet many types of applications in varying size plants. For example, compare its expansible memory—capacity up to 52,000 words. Compare its flexible input/output—capable of scanning up to 1500 instrument inputs. These are maximum capabilities, expansible from a minimum system. You buy a system tailored to your exact requirements.

Add to this versatile equipment the computer systems engineering ability demonstrated by General Electric in implementing these twenty GE-312 system applications.

Add also the long history of General Electric overall systems know-how—its broad background in the equipment, processes and materials to which you apply computer control.

Tomorrow's profits will come from today's combination of vision, equipment, and know-how. *Where do you stand?*

There are General Electric Sales and Application engineers in over one hundred offices throughout the nation to serve you. *Phone* the nearest General Electric Apparatus Sales Office, or *wire* General Electric Computer Department, 13436 North Black Canyon Highway, Phoenix, Arizona.

PROCESS CONTROL
AUTOMATED BY GENERAL ELECTRIC

Progress Is Our Most Important Product

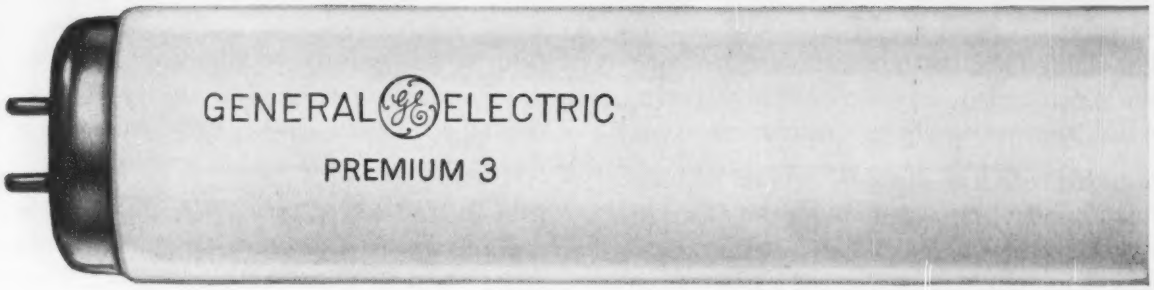
GENERAL ELECTRIC

CPA-50 (9-60)

General Electric—a pioneer in computer systems for all phases of business, industrial, scientific, engineering, and financial endeavor.

50% MORE LIGHT

FROM ANY 2-YEAR OLD 40-WATT SYSTEM



New G-E Premium 3 Fluorescents. If your customer's present 40-watt fluorescents are two years old or more, he can probably boost his lighting level by 30% to 50%—overnight—without spending a single capital expense dollar! How? By replacing the old fluorescents with new General Electric Premium 3 Lamps. Fact is, he'd gain *at least* as much extra light as his present lamps would deliver if they were a foot longer and used a lot more electricity.

G-E Premium 3 Lamps are new from end to end. New "Wattage Miser" Cathodes that cut wattage loss . . . new, more efficient "Bonus" phosphors . . . improved gas mixture. And like the *standard* 40-watt fluorescents, the F-40, they operate in starter-type *or* Rapid Start circuits. General Electric Premium 3 Lamps are first to deliver over 3,000 lumens . . . giving you more light at the lowest possible cost. For more information, call your G-E Lamp distributor today—or write: General Electric Co., Large Lamp Department C-032, Nela Park, Cleveland 12, Ohio.

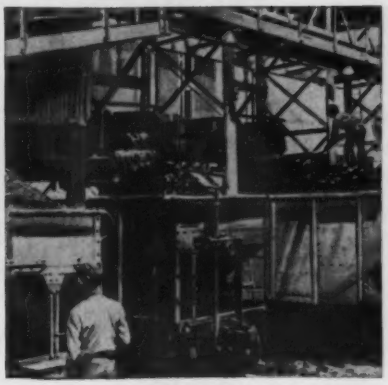
Progress Is Our Most Important Product

GENERAL ELECTRIC

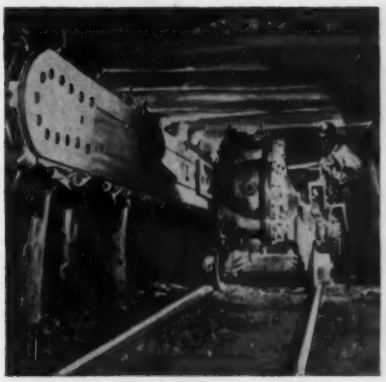
BEACON *COAL* HAS WHAT IT TAKES

MEN

MINES

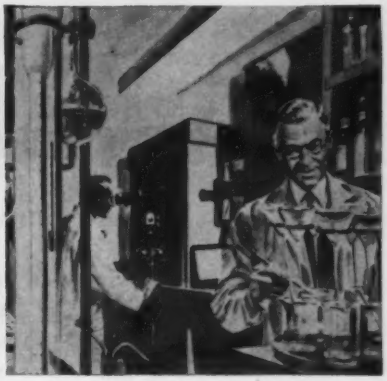


CAPACITY



EQUIPMENT

PREPARATION



QUALITY CONTROL

To give the electric utility industry the coal, the assurance, and the service it needs

Next time you write the specifications for the kind of *coal* you want, why not jot down the specifications of the kind of *supplier* you would like to have . . . and see how we measure up!

We have been serving electric utilities for many years, and feel that we know intimately their needs and problems. Our 15 mines provide a variety of coals, and a potential that can deliver up to 15 million tons a year at need. Modern mechanization plus skilled miners equip us to gear production to virtually any emergency you might encounter, and mine location on a number of major railroads gives wide latitude in routing. We maintain close check on quality in our laboratories. Our representatives are men who have made coal their life work and the serving of customers their highest aim. Finally, our past record, if you care to check it, provides complete assurance that you will get the coal you want, when, where, and as you want it.

EASTERN GAS AND FUEL ASSOCIATES

PITTSBURGH • BOSTON • CLEVELAND • DETROIT • NEW YORK
NORFOLK • PHILADELPHIA • SYRACUSE

For New England: New England Coal & Coke Co., For Export: Castner, Curran & Bullitt, Inc.

BEACON COAL

EASTERN GAS AND FUEL ASSOCIATES — BEACON COAL

Order Southwire **THW** Building Wire

Demand is as high as Ben Franklin's kite for new Southwire THW Building Wire. No wonder. Look what it has to offer:

- *Costs less to buy*
- *Costs less to install*
- *Weighs less*
- *Easy Pulling—lubricated surface*
- *75° C rating—wet or dry locations*
- *Carries more amperes per unit of costs and weight*
- *Comes in any solid color*
- *UL approved, of course*

When you order Southwire THW, you get Southwire service at no extra cost. Write, wire or phone today!

Southwire Company

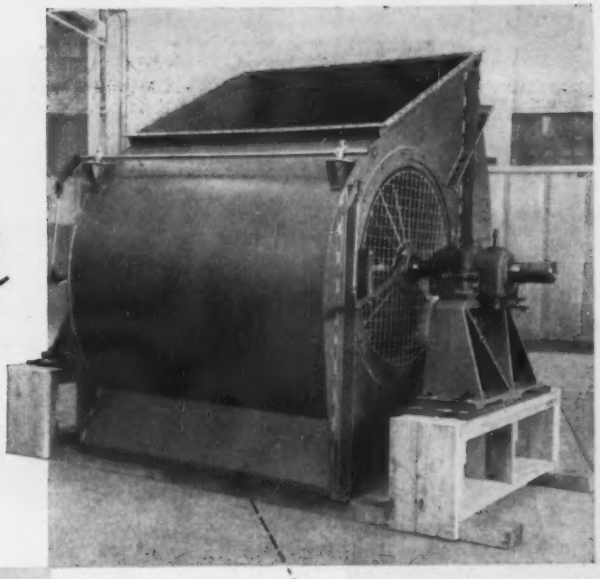
Carrollton, Georgia—TErrace 2-6311

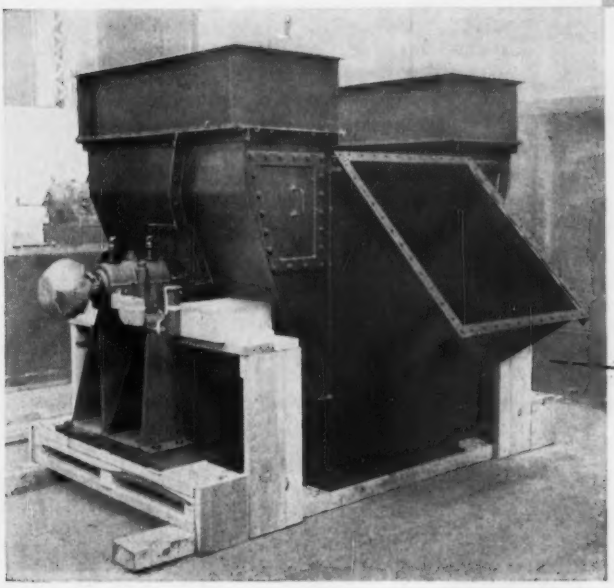
SOUTHWIRE serves the world

ALUMINUM • COPPER • STEEL STRAND

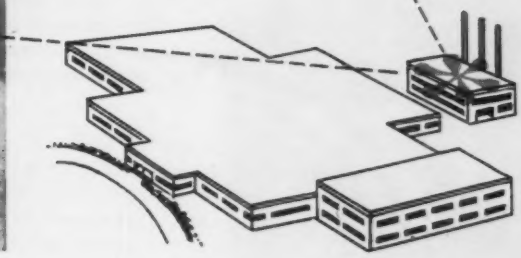
- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene, Polyethylene, and VWP* (Vinyl) Weatherproof Copper, Aluminum and Triplex
- U.R.C. (DBWP, TBWP) Copper
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Galvanized Steel Guy Strand and Static Wire
- Aluminized Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories
- NM Sheathed Cable
- ALSO FABRICATORS OF COPPER AND ALUMINUM FOR WIRE AND CABLE MANUFACTURERS

Headed for another tough job





...this mechanical draft "team" of top performers from CLARAGE



FOR FORCED DRAFT... FOR INDUCED DRAFT... AGAIN CLARAGE QUALITY IS THE CHOICE! These Clarage units, pictured on the shipping dock, will soon be in service at one of the nation's leading paper mills.

At the top is the Clarage Type AF Dynafoil forced draft fan with airfoil blades and Vortex Controls at the inlets; below is the Clarage Type DN Dynacurve induced draft fan with 36 forward curved blades. Clarage equipment, such as this combination, has been selected for over 4,500 central stations and industrial power plants. These users know that with anything as vital as uninterrupted operation, it pays big dividends to get the best in equipment—Clarage.

For complete information, request Catalog 905 on the Type DN, Catalog 859 on the Type AF, and Catalog 901 on the Type RT induced draft fan.

Dependable equipment for making air your servant

CLARAGE FAN COMPANY

Kalamazoo, Michigan

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

TREND OF DISTRIBUTION TRANSFORMER LOSSES
PERCENT
100
90
80
70
60
50
40
30
20
10
1925
1930
1935
1940
1945
1950
1955
1960
COPPER LOSS
INDUSTRY STANDARD
STANDARD TRANSFORMER
CORE LOSS
EXCITING CURRENT
10
Standard

"... no TV picture shrinkage ..."

"... sure starts on farm and home equipment ..."

"... better regulation ..."

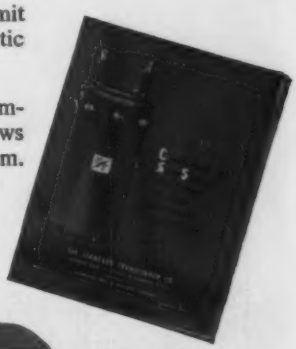
"... better voltage at the entrance switch ..."

"The most important design advance since grain-oriented steel"

Clever design and efficient use of materials have made the all-new Standard SWA Distribution Transformer the most talked about transformer in the field today. Utility engineers estimate that 3% to 4% of peak load is represented by distribution transformer losses. The SWA slashes copper losses by a dramatic 30%! This new transformer reduces "unaccounted for" KWH; increases revenue by better regulation; and, because lower losses produce a slower temperature rise, the SWA will carry overloads safely. Your nearby Standard Transformer representative can show you what the SWA's can do on your system and how they pay for themselves.

Now is the time to put the SWA on test. Measure the results to your own satisfaction . . . compare them with conventional units. Our own figures are documented in Standard Bulletin S-401-C. They verify what engineers have suspected for years . . . that a transformer with radically lower copper losses, lower impedance to reduce voltage drops, and improved thermal time constant to permit overloads without excessive heating could be produced at a realistic price. It has been done and it was done FIRST at Standard.

Write for Standard Bulletin S-401-C today. It tells the complete story on the all-new SWA distribution transformer and shows how to determine the increased profit it can produce on your system.



Phone WARREN
EXpress 2-1563

40 years of concentration on transformer design exclusively

Standard Transformer CO.

WARREN, OHIO

"WHEREVER THERE IS POWER"

From nuclear power to electric energy...

POWERIGHT PARANITE®

POWER CABLE

The new **Enrico Fermi Atomic Power Plant** near Monroe, Michigan, will be operated by Power Reactor Development Company and The Detroit Edison Company for the expressed purpose of demonstrating the practicability of the use of nuclear energy for the generation of electric power. Criticality is scheduled for December 1960.

Paranite Wire and Cable was selected to supply 600 Volt network and 5000 Volt shielded cables for the nuclear section of this major new development. To us it's evidence once again of the nationwide acceptance of Paranite's 70-year record of dependability.

From 600 volt network through 28,000 volt power cable, Paranite's complete line is ready to serve you. If yours is a special application problem the Paranite engineering department invites your inquiry.

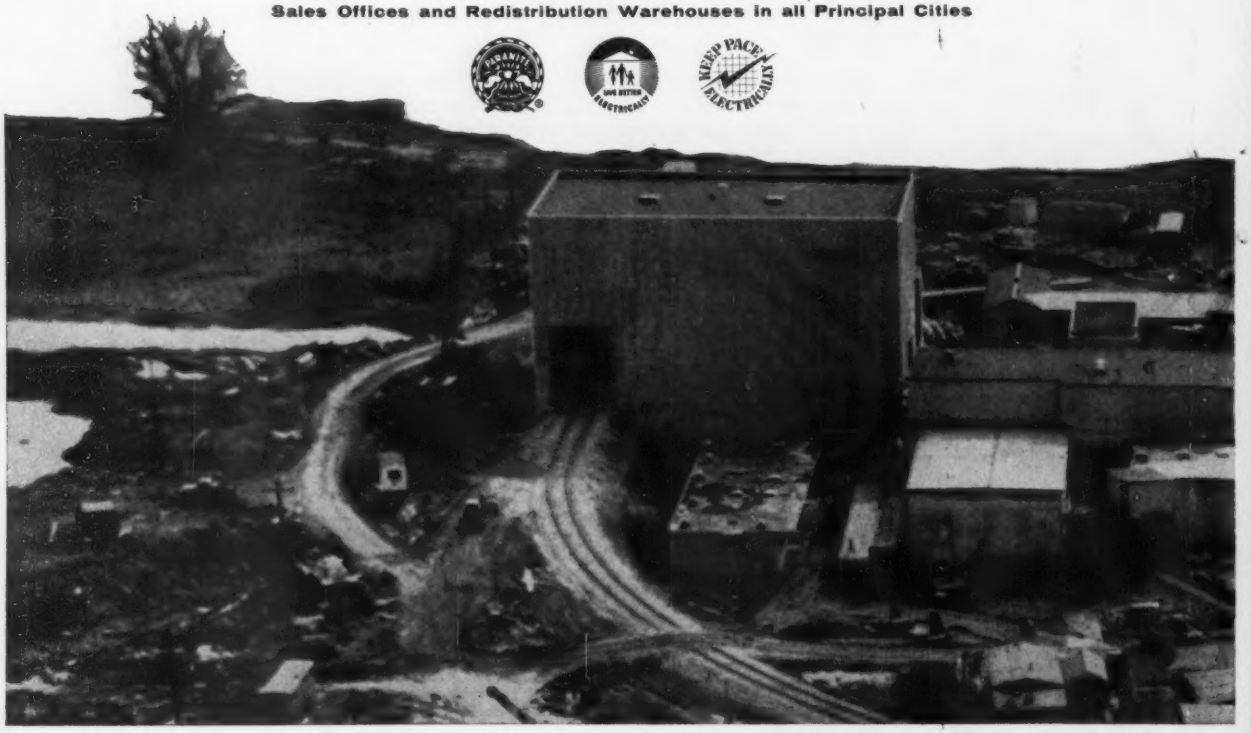
Since 1890

PARANITE WIRE & CABLE DIVISION

ESSEX WIRE CORPORATION, Marion, Indiana

MANUFACTURING PLANTS: Marion, Ind.; Jonesboro, Ind.; Tiffin, Ohio; Anaheim, Calif.

Sales Offices and Redistribution Warehouses in all Principal Cities



A. Paranite **HIGH VOLTAGE CABLES** are manufactured in a complete range of sizes—1000 through 28,000 volt single conductor, 3000 and 5000 volt three conductor. Adaptable for aerial, direct burial or underground duct installation, wet or dry location.

B. Paranite manufactures a complete line of 600 volt **NETWORK CABLES** in gauge sizes through 2,000 MCM. Insulations available include 60°C, 75°C and 90°C types for use in either wet or dry locations.

Here are answers to some about KPF switches

Q. *How can KPF switch blades maintain positive contact with switch clip under changing line sag conditions?*

A. Two heavy copper clips, bolted to a shoe carrying the flexible jumper, are mounted inside a special "horseshoe shaped" casting by two toggle bolts. These toggle bolts pass freely through the outer leaves of the clips, and the entire contact assembly "floats" on these bolts. Half-spherical bolt heads and adjusting nuts permit movement in any direction. The tension of the clip leaves on the blade is sufficient to insure positive alignment, since either clip or blade can follow the other to conform to line sag changes.

Q. *How can insulator stacks follow normal line sag changes?*

A. The insulator stack bearing units may be likened to limited universal joints. The actual bearing, a monel pin in an everdur trunnion, allows 90° movement of the rotating arm of the phase unit, as well as approximately 7° vertical movement to follow line sag. It is impossible for the bearing to bind under normal line stress, and insulator stacks always follow the sag of the conductor.

Q. *How are conductors connected to KPF switches?*

A. With KPF Type A switches, the user eliminates dead-end insulators. Any standard strain clamp can be used, and hot lines may be dead-ended directly to the phase units. Switch arms and dead-end eyes are integral with the insulator assembly. The conductor is lead through the strain clamp and on to a copper terminal on the switch arm. Aluminum conductors may be connected to the switch arm through special KPF terminals designed for this service. Type A switches may be mounted on a separate crossarm with conductors deadened below or above (for angle-pole installations, etc.). Switch operates equally well with or without line tension.

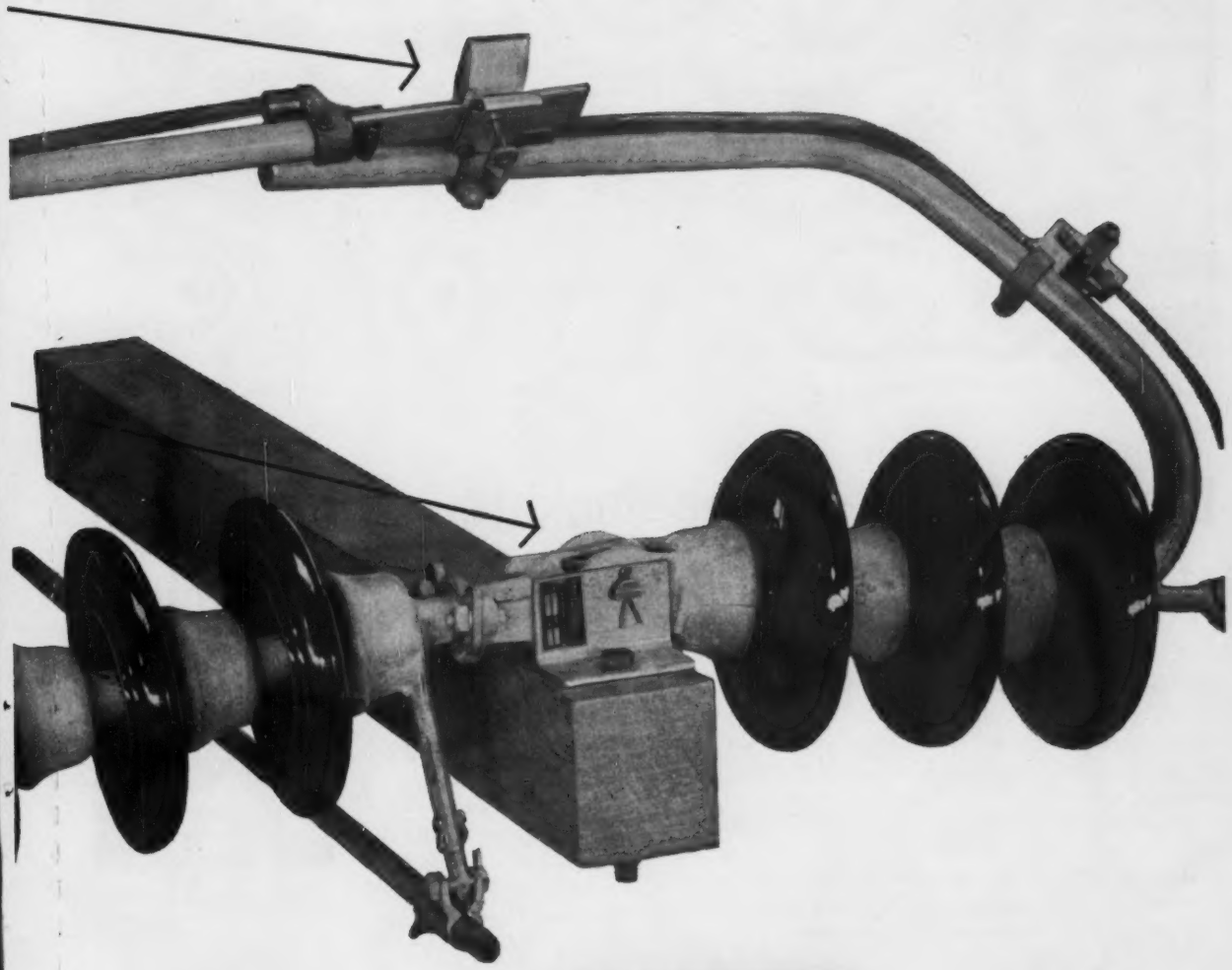
Q. *For what voltages are KPF air break switches available?*

A. KPF Type A and S standard "line-tension" switches are available for common voltages from 7.5 to 110 KV. Special switches combining a disconnect with a fuseholder (Type UF, double-cross-arm mounting) and for use where line tension is not present are also offered in these same voltage ranges. Ground switches are available for Type A or S switches. Type R switches are offered for use where line tension is not present or it is desired to use a specific type of apparatus insulator.

KPF

Request Catalog or write for details.
Test on your system this month!

often-asked questions



KPF

AIR BREAK SWITCHES

Standard for half a century

KPF ELECTRIC COMPANY

P. O. Box 1257E • Stockton, California
HOward 4-8381

5218

Industry-proved through a quarter century of service...THERE'S NO DOUBT ABOUT NEOPRENE

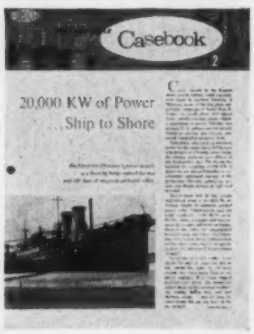
One of American Airlines' fleet of Boeing 707 jet flagships parks at new passenger terminal. Neoprene jacketing protects 68,500 feet of underground lighting cable serving the terminal's apron.

Dependable neoprene jacketed cable lights the apron of another new Idlewild terminal

Marshy soil at New York International Airport poses special problems for underground power cable. Excessive moisture that collects in ducts makes life tough for ordinary jacketing. That's one reason why neoprene jacketed cable has been a standard at Idlewild for years. One of the most recent installations is at American Airlines' new jet-age passenger terminal. Here all underground lighting cable serving the terminal apron is protected with durable neoprene jackets, specially compounded for maximum water resistance.

Neoprene jacketed cable has thoroughly proved itself at Idlewild, as elsewhere. Just in the last two years, over 500,000 feet of neoprene cable has been installed during construction work at other Idlewild terminals . . . and all this is in addition to the uncounted millions of feet that have been buried at Idlewild since the airport's inception in 1942.

Neoprene jacketing's proven resistance to weathering, abuse, temperature extremes, flame, hot and cold flow can mean economical *long term* protection for the cable you use. E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. EW-10, Wilmington 98, Del.



Free—Du Pont's new
WIRE AND CABLE CASEBOOK
Each issue contains case histories from the electrical industry on the use of neoprene jacketed cables. Subscriptions free on request.

DU PONT
REG. U. S. PAT. OFF.

NEOPRENE
SYNTHETIC RUBBER

Better Things for Better Living . . . *through Chemistry*

A MAJOR ADVANCE IN SUBSTATION PLANNING!

By-Pass Switch Disconnects Regulator Without Interrupting Service

Requires No More Space Than a Load Tap-Changing Transformer

Independent Single-Phase Regulation

Shipped Completely Assembled or as Separate Components

NEW FROM ALLIS-CHALMERS

REGU/TRAN

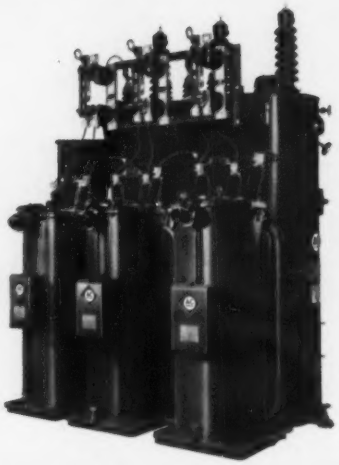
Only REGU/TRAN adds complete flexibility to load tap-changing transformer installations

New REGU/TRAN — a unique, integral Regulator-Transformer assembly now available to substation planners! *Versatile* — with true independent phase regulation of three-phase power. *Flexible.* For a minimum investment, you can procure REGU/TRAN transformer alone, add regulators and by-pass switches as you need them. *Economical.* Meets the problem of unbalanced loads and varying lengths of single-phase feeders.

Result: improved service, maximum unit utility and safety . . . less maintenance expense. A-1362

ALLIS-CHALMERS NEW MINIMUM-INVESTMENT APPROACH TO SUBSTATION REGULATION, TRANSFORMATION

REGU/TRAN



INDEPENDENT PHASE REGULATION — Three single-phase regulators improve voltage control, increase revenue.

MINIMUM INVESTMENT — Buy REGU/TRAN transformer first. Add regulators, by-pass switches as you need them.

MOBILE — Shipped complete or separately for on site assembly.

FULL KVA CAPACITY — Full kva rating carried on any tap position.

TAILORED REGULATION — If just ±5% regulation is needed, that's all you purchase. No need to pay for unused voltage range.

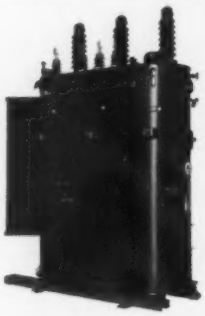
LINE-DROP COMPENSATORS — Potential and current transformers included. Nothing more to buy or connect.

VERSATILITY — Use REGU/TRAN transformer, regulators as separate units. Remove a regulator for emergency service elsewhere, transformer continues in service.

SAFETY — By-pass switches are fully visible. Permit de-energizing regulators and control without interrupting service.

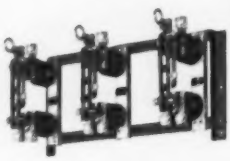
LOW MAINTENANCE COST — Perform regulator inspections, service anytime — no waiting or weekend overtime cost. Unit construction makes untanking fast and easy.

More **REGU/TRAN** *facts?*
Write, wire or call . . .



CLEAN, UNCLUTTERED APPEARANCE with sealed-tank construction has no external braces to trap debris, reducing costly cleaning and repainting requirements. Entire line is computer-designed to provide minimum height and weight, quiet operation, ample overload capacity and corona-free performance. All transformer accessories are conveniently grouped to reduce inspection and maintenance time.

LOW-COST, EFFICIENT DISTRIBUTION REGULATORS. Now 33% lighter, shorter with famous **Feather-Touch** control. Super-sensitive and responsive to voltage changes — 1% control accuracy and 20% range of regulation. Mechanical strength 40 times normal short-circuit conditions on all **Vari-Amp** positions. New oil-level sight gauge reveals oil level at a glance.



RELIABLE, COMPACT BY-PASS SWITCHES. All operations are performed in complete safety and in proper sequence. Visible break switch opens both leads to the series windings . . . safely interrupts exciting current. Locks securely — no accidental dropping of load.

REGU/TRAN, *Feather-Touch* and *Vari-Amp* are Allis-Chalmers trademarks.

ALLIS-CHALMERS . . . Pacing Power Progress

Power Equipment Division • Milwaukee 1, Wisconsin

Electrical World

OCTOBER 24, 1960

Editorial Comment

Low Voices Suggest Controls on Equipment Buying, Selling

A highly distressing murmur can be heard if one listens intently. A few low, insidious voices are suggesting that government should control or regulate selling and/or buying of electrical utility equipment.

Such talk is defeatist, dangerous and unjustified. It should be opposed wherever it is heard.

We have referred to the current equipment pricing situation as a "price war." We no longer will do so. Though its price changes were sudden, the utility equipment market now is, in general, no more distressed than many other markets.

Natural economic forces, plus economic wisdom applied by buyers and sellers, will in time bring sense to all markets. So controlled protection of sellers by government or by industry is without merit.

Past abuses in the marketplace will be dealt with by the courts. But there is no precedent for routine surveillance of a market by the courts beyond the time it is evident that "cease and desist" orders have been obeyed.

And controls which might remove management prerogative to buy equipment in accordance with best management judgment flatly are not needed.

The voices murmuring a tentative, plaintive need for governmental control are voices of gloom. They disregard history's lesson: Government steps easily into a situation, and is nearly impossible to get out.

We are thankful the voices are very few and very low.

Pride in Power Can Cause Perspective Loss, Trouble

It would seem natural for speakers to trumpet from every electrical industry rostrum that *electric power* is what has made the American economy what it is today.

Our power industry is a mighty enterprise, and we are justly proud of it. There's little question that the economy would be much smaller without electricity to turn its wheels.

But let's look objectively at the implied thesis that electric power *alone* has made America. Can we ignore the fuel engine and its contribution to transport, to agriculture, and construction? What about electronic devices and their gift of instantaneous communications? What about the credit system which ensures consumer buying power? What about . . . but we could go on . . . and on.

The careless claim that electrical power is the *sine qua non* of an industrial economy is seized and built upon by self-seeking politicians and those advocating federal government assumption of all utility responsibility.

They cry categorically that power development must precede industrial development, thus power growth must be forced artificially in order to get industrial growth.

Attempts to refute can be met with gleeful quotes of careless statements.

Electric power provides but a component, though *a* most important one, in America's vast, burgeoning economy. False pride must not be allowed to imbue it with greater importance than it really has.

New Democratic Power Plans Go Far

Council asks dominant federal atom role, financing fund for public projects, TVA-type groups for Alaska, Northwest

An all-out program for public power and deeper federal involvement in expanding the nation's power and energy resources was spelled out last week by top Democratic advisors to candidate John F. Kennedy. It goes 'way beyond the Democratic platform in its detailed recommendations for a top-to-bottom change in federal power policies.

The report—published by the Natural Resources Committee of the Democratic Advisory Council—has as its slogan for power: "Abundant, Low-Cost Power, Widely Distributed."

While Kennedy's name is not on the report, the study was made and the report published with his approval. He is a member of the Advisory Council, and the recommendations are in fact a Kennedy "position paper" on resources development.

Girard "Jebby" Davidson, former assistant Interior Secretary, headed the resources group in its discussions and put the final touches on the report. Others on the committee include General Manager Clyde Ellis of the National Rural Electric Cooperative Assn, former Interior Secretary Oscar Chapman, former Chairman Gordon Clapp of the Tennessee Valley Authority, former Assistant Interior Secretary William Warne.

The committee says there is a need for re-assessment of the nation's power policy, adding, "A basic policy problem is how to take advantage of the efficient, big, modern generating plants without encouraging monopoly in power supply and transmission."

List 14 'Musts'

The report emphasizes a number of requirements: **(1)** "Giant power" development; **(2)** A national fuels and energy policy; **(3)** Creation of a joint Congressional committee and White House agency on resources; **(4)** A new formula for allocating multi-purpose project costs; **(5)** Principal responsibility for nuclear power development by the federal government; **(6)** Continued low—2%—rural electrification interest rates; **(7)** Creation of more valley-type power marketing agencies; **(8)** Continuation of the public power preference clause; **(9)** Tighter regulation by the Federal Power Commission, including an end to extended 50-year power licenses and permitting utilities to collect deferred taxes; **(10)** Emphasis on the federal power "yardstick;" **(11)** More federal transmission lines instead of private wheeling arrangements; **(12)** Creation of a national "investment fund" to insure low-cost financing for federal projects; **(13)** Distinction in budgeting between expenditures and investment in "self-liquidating public works" projects; **(14)** Removal of the bond restrictions on TVA.

Giant power is called "the key to efficient use of modern electrical technology and to a national power supply system." The report calls for regional wholesale power supply systems independent of power distributors, supplied by "as much hydroelectric capacity as is economically feasible."

National fuels and energy policy, along with long-range resource development planning, is stressed by the committee. This calls for "progressive evaluation standards for multi-purpose projects" and "cost allocation formulas for multiple purpose projects which are consistent

AEC Fails to Patch Up GE–Allis-Chalmers

GE refuses to bow out of construction award as AEC seeks to change award after re-evaluation of original bids

Attempts by the Atomic Energy Commission to patch up differences between General Electric Co and Allis-Chalmers Manufacturing Co on construction of the improved cycle boiling water reactor—to be operated by the Los Angeles Department of Water & Power and Pasadena Municipal Light & Power Department—have come to a stalemate.

General Electric—in meetings with the Commission at Germantown—has refused to bow out of a $12.5-million construction award which it got from AEC on June 23. The Commission is considering re-awarding the construction job to Allis-Chalmers as a result of a re-evaluation of the original bids (GE, A-C, Combustion Engineering Co, and Westinghouse Electric Corp).

AEC had submitted the GE draft contract to the Congressional Joint Committee on Atomic Energy on June 21, but recalled it when arithmetical errors were discovered in the bid evaluation process. A transposition of figures added about $600,000 to the Allis-Chalmers bid, according to Commission officials.

GE spokesmen at the recent Commission meetings referred to their letter to AEC Chairman J. A. McCone—forwarded immediately after AEC had recalled the draft contract from the Joint Committee.

GE Stands Firm

In the letter, GE took the stand that the company should not be asked to step aside for the Allis-Chalmers reactor bid. The letter implied also that, in this particular instance, technical specifications were being overruled. The position set out in the letter remains GE's present position as of last week.

AEC has classified the entire matter as "internal Commission business." The Commission will neither confirm nor deny that Allis-Chalm-

Beyond Party Platform

with the principle of regulation by competition."

A "Council of Resources and Conservation Advisors" in the executive office of the President and a "Joint Committee on Resources and Conservation" in Congress is urged by the Democrats to carry out long-range planning.

Atomic power "should be made available from federal nuclear power plants as soon as production costs can be materially reduced," the report states, and, "The Atomic Energy Act should be amended to establish primary federal responsibility for developing economic nuclear power plants as yardsticks in nuclear power generation." However, "Private and consumer-owned utility systems should be encouraged to construct atomic power plants under rational safeguards." The Democrats also call for an increase in nuclear research and safety regulation.

Seek Strengthened FPC

Regional development agencies with revenue financing powers (such as TVA) "should be created where called for," adds the committee, "as in the Pacific Northwest and the Yukon River Basin of Alaska."

Federal Power Commission activities would be strengthened and extended by the Democrats, including an expanded staff to speed up processing of cases. "Comprehensive development of entire river basins . . . must be restored as the standard," adds the committee report, and "The granting of new 50-year licenses to existing projects when minor redevelopment occurs . . . must cease." Also, "Regulated companies must be allowed to collect for taxes only the taxes they actually have to pay.

"Full 'yardstick' competition in the otherwise monopolistic power industry will assure low-cost service in the public interest," the report continues. Among other things to achieve this, the committee recommends "Federal power agencies should be authorized to transmit power generated by local public and cooperative electric systems."

A "National Investment Fund" should be created, says the report to provide funds for "prudent and essential resource projects"—federal, state, local or private—when such funds "are not available privately on reasonable terms."

The Democratic report calls for distinction in federal capital budgeting between "normal current expenses" and "self-liquidating public works." The present system, which doesn't distinguish, "is unrealistic and unbusinesslike," say the Democrats.

GIRARD 'JEBBY' DAVIDSON

The Tennessee Valley Authority's "highly successful programs must be fully supported and the limit on TVA bonding authority ended," the committee says, with the added complaint that a geographic limitation was "imposed as the price for Presidential approval of the much-needed TVA Self-Financing Act."

The committee blasts the Eisenhower Administration for the "Dixon-Yates plot" to weaken TVA, the "giveaway" of the Hells Canyon power site, efforts to sell or abandon federal transmission lines, raise the REA interest rate, new "free ride" 50-year FPC licenses, and "a deferred tax racket . . . which has given private utilities an incredible bonanza . . . Private power and gas companies have been permitted to collect hundreds of millions of dollars in deferred taxes from their customers—taxes they will never have to pay—and to charge the customers interest on the money."

Controversy on L. A. Reactor

ers will ultimately be named to build the government-owned, municipal-operated reactor.

Informal, behind-the-scenes protests by reactor manufacturers that GE's bid had been far too high have just about run their course. For a while it appeared the protests were aimed at a full-scale Congressional investigation of the entire matter. But since then, strong Congressional voices emanating from JCAE have dismissed any contention that ulterior motives were involved in the first AEC award. The GE selection, moreover, was justified on the basis of an advanced steam separation component included in the company's reactor design.

After private briefings from AEC officials in the closing days of Congress, Rep Craig Hosmer (R-Calif.) joined with his fellow Californian and JCAE associate, Rep Chet Holifield (D-Calif.), in agreeing that the arithmetical mistakes made by the Commission staff in computing the proposals originally were understandable. The Los Angeles-Pasadena reactor will generate electricity for Holifield's district.

The two Congressmen believe the full JCAE would waive during the Congressional recess a 45-day waiting period (required of all joint federal-utility nuclear power projects). This would in effect constitute Congressional approval, once AEC agrees on which reactor firm is to build ICBWR.

Humboldt Bay Gets Permit

A provisional construction permit has been issued for Pacific Gas & Electric Co's Humboldt Bay 50-Mw nuclear power reactor by Atomic Energy Commission Hearing Examiner J. D. Bond.

If there are no interventions or no AEC objections, the permit will automatically become the full Commission's order on Nov. 8.

'HOW CAN COMPANY IMAGE BE IMPROVED?' asks Chairman J. K. Busby (Pennsylvania P&L) of panel including (left to right) G. C. Rawls (Louisiana P&L), W. T. Lucking (Arizona PS), and J. H. Campbell (Consumers Power)

PIP Conference told:

All-Industry

Conference urged to support massive program encompassing all private industry. Stress need for tax equity

■ Every industry in the US must stand ready to protect all industry against nationalization, F. G. Clark told the Public Information Program (PIP) Workshop Conference at New Orleans. By working together, they present the strongest defense against the Fabian divide-and-attack technique. Clark is general chairman of American Economic Foundation.

The future of America's split economic system—part public and part private enterprise—rests upon its people's ability "to understand and control the enormous engines of political economic power," Clark continued. "The people can now vote away other people's freedom and expropriate other people's money," even the future earnings of their children and grandchildren. And unions have the legal right to refuse to use the tools of production and to prevent other workers from using them.

Clark urged that all private industry unite in "a massive information program," based upon "axiomatic truths" to promulgate "a comprehensive, coordinated blueprint of man's economic life." It should stress these "ten pillars of economic wisdom:"

1. Everything has a source, a destination, and a cost that must be paid.

2. Everything that government gives to people it must first take away.

3. The only valuable money that government has to spend must be taxed or borrowed out of people's earnings.

4. The only worthwhile job security is customer security.

5. Job security requires partnership between workers and the boss to win and hold customers.

6. Wide-spread wage increases without corresponding increases in production only increase everybody's living cost.

7. The greatest good for the greatest number requires the greatest productivity per worker.

8. All productivity is based upon natural resources, human energy, and tools.

9. Proper payment for tools is essential.

10. The productivity of tools is highest in a competitive society, rather than a state-planned society.

Government expenses in recent years have climbed much faster

'STAND READY TO PROTECT ALL INDUSTRY' urges F. G. Clark (American Economic Foundation) in panel with Dr A. C. Neal (Committee for Economic Development) moderated by Kenneth McCord (Washington Water Power)

Information Program Needed

than private purchases to upwards of 20% of total production, reported Dr A. C. Neal, president, Committee for Economic Development. This Committee finds that they follow Parkinson's Second Law —"expenses rise to meet income" and accordingly leave little margin for tax cuts. Neal was "very dubious" about proposals to accelerate economic growth to 5% per year by government pressure, observing that expenditures in excess of income spur inflation.

Tax inequity is the main handicap to meeting government competition, said Sherman R. Knapp, president, EEI and Connecticut L&P Co. If tax equity could be accomplished, the grounds for public vs private feuding would ease.

"Why shouldn't private utility customers have civil rights?" Knapp demanded. "They pay in their bill some share of the cost of government. Why shouldn't public power customers make a similar contribution?" But tax equity cannot be achieved until private utility customers are made to realize that they "are being cheated," he said.

Electric companies must also combat the concept "that government has full utility responsibility in any area," Knapp continued, and keep up its guard against the "unreasonably low" standards by which government projects are justified.

The electric industry has ample reason to boast about its research and development, said L. M. Olmsted, *Electrical World*. He traced the record of electrical research from atomic power and more exotic energy sources, through EHV transmission, to distribution and utilization. Industry's speakers should be telling about it from every platform and in every ad. Effective publicity at the grass roots can help to build the image of a virile, forward-looking, well-managed and public-spirited utility industry.

Fundamentally the electric companies' problem is getting along with people, said G. C. Rawls, Louisiana P&L, in a presidents' panel. It suffers from a lack of unanimous cooperation in telling its story to the public. And it needs the support of all its employees, derived from their sense of pride, so that each can become effective as "a spokesman for the industry," he added.

Electric companies must motivate all their employees to "get into the game" of public relations, said J. K. Busby, chairman, PIP Steering Committee, and president, Pennsylvania P&L Co. The framework of all public relations must be the customer, and the information must adhere to integrity and veracity.

Good Neighbor Policy Urged

Utility customers "have a right" to get good service, said J. H. Campbell, president, Consumers Power Co. But "obviously neither the electric companies nor the electrical industry has captured the fancy of the public." It will be swayed only by their utility becoming "part of the ball club."

Expanded effort to build a favorable nation-wide image was urged by W. T. Lucking, president, Arizona PS Co. "Are you more concerned with the FPC than whether you can live at all?" he said. "Who controls major transmission will control electricity in this country."

"What about the farm people you are trying to reach?" asked Carroll P. Streeter, editor, *Farm Journal*. They have resolved to live and work as other Americans do, or leave the farm and go where they can. Farmers are caught in a price squeeze and they are determined to strengthen their bargaining power. But farmers are good citizens and will favor whatever they believe to be right.

Farm areas for the next 25 years will be the best growth market for power suppliers and appliance dealers, Streeter continued. Farmers feel that their present power availability is adequate but show some concern about reliability, with a few asking about underground. And many of them favor private industry to do the job, especially where the electric company works with them as a friendly partner. Streeter urged utilities to bury past prejudices and start selling what they believe in.

'THIS COCOANUT will remind you of Arizona PS,' A. F. Tudor (right) tells E. W. Smith (Pennsylvania P&L) as co-chairman J. N. Kerr Jr (PS of Colorado) watches from the rostrum

This month in Europe . . .

British View Electricity Cost Rise

J. H. M. SYKES, Overseas Correspondent, London

"Electricity to Cost More" were the bold black headlines in British newspapers a few weeks ago when the Electricity Council and the Central Electricity Generating Board presented their Annual Reports. The top increase to be applied by any area electricity board is 10%. It might have been greater than it was, but for the improvement in efficiency that has taken place in British power stations in recent years.

Sir Christopher Hinton, chairman of the Generating Board, explained the situation this way to *Electrical World* in a recent interview:

"One reason we have been able to hold our costs arises not only from technological advances, but from the location of power stations. Our new conventional stations are being built in cheap coal areas, and near the pits, so that we minimize transport costs.

"But in the technological field, certainly, the advances have been remarkable. The large sets that we are now building have marginally higher efficiencies than the sets that were being ordered three or four years ago, because they are using steam at the same temperature and pressure: 1,050F and 2,350 psi. Also, they do have slightly higher efficiencies because they are larger. But recently we ordered two supercritical turbine generator sets. These will work at pressures of 3,500 psi and steam temperatures of 1,100F and give still higher efficiencies. Beyond that, in the cycles that are being used at the moment, it is difficult to see very substantial future advantages."

Metallurgy Seen as Key

Asked whether there was not a limit to the gains attainable by improvement to the steam cycle, Sir Christopher replied that further progress appears to hinge on metallurgical developments.

"This limit," he said, "is the limit of the top temperature which you use in your heat cycle. The limitation on the temperature that we can use arises largely from metallurgical developments and as these developments enable us to use higher temperatures in the heat cycle we can hope for higher efficiencies. And I think we can quite reasonably look forward to continued improvement."

Prophesies Power's Future

At the press conference accompanying the presentation of the annual reports of the Electricity Council and the Generating Board, the future pattern of British power stations was outlined. Key points were these:

1. No generating sets smaller than 500 Mw are to be ordered in the future except for a few special cases.

2. Stations of 2,000 Mw will be the "standard" size for the next few years.

3. Stations will generally be located near coal fields.

4. But it is to be noted that until more operating experience is available, the difference in thermal efficiency (38.5% vs 39) between the best sub-critical and the supercritical plants is not considered enough to justify wholesale change to supercritical.

Average thermal efficiency in Britain has risen from 20.91% to 26.53% in the period from 1948 to 1960, and the Board hopes for an average of 30% by 1965. During the year (1959-1960) under review, two units of 300 Mw, two of 350 Mw, and one of 550 Mw were ordered, all for 2,300 psi and 1,050F, reheat to 1,050. Total generating plant in service, in England and Wales, was 25,529 Mw, an increase of 2,219 Mw (9.1%) on the previous year. Works cost per unit sent out dropped during the year from 0.647 pence to 0.6065 pence. (One pence very closely equals one cent US.)

Units sold during the year totalled 93,042 million kwhr, an increase of 10.1%. As some measure of operational efficiency units sold per employee rose from 1,590,000 to 1,755,000, a rise of 10.4%. For the industry as a whole, including the area electricity boards, a surplus of $74.76 million was reported. The average price of electricity to the 15,499,838 consumers fell from 1.554 pence to 1.506 pence during 1959-60. Sales were up by 9.8% for the area boards, the difference between this figure and the 10.1% increase in generated units sold being accounted for by direct sales to railroads and a few other statutory bodies, the only sales permitted outside the area boards' organizations.

The other electrical news in Britain has concerned the merger announcement affecting English Electric and General Electric. With Associated Electrical Industries emerging as one of the world's largest electrical manufacturing combines, it was logical that the two next largest should consider some form of amalgamation. This merger will be the largest in British industrial history, and the combined assets of the holding company will exceed £117 million ($327.6 million). Lord Nelson, or his son, the Hon H. G. Nelson, at present managing director of English Electric, will head the new combine.

Kincardine Generating Station Opened by Queen

Kincardine Generating Station, opened on Oct. 12 by the Queen of England, has received 15 132-kv, 3,500-Mva air-blast circuit-breakers.

The station has also installed equipment in the main electrical control room, the control desks for the generator equipment in the plant control rooms, relay equipment for the protection of the generators and generator transformers, a 15-Mva station transformer, and a 20-Mva starting transformer.

Six 275-kv, 7,500-Mva air-blast circuit-breakers, capable of being uprated to 15,000-Mva, are on order.

News Scope

DOUBLE-TAKE — After learning of the Ohio PUC ruling that cost Cincinnati G&E a second one-third of its rate request, R. S. Locher, Cleveland's law director, feels he can build a stronger case against Cleveland Electric Illuminating Co. Says Vice President Lee C. Howley of CEI: "We're still below what the PUC allowed that company (CG&E)." The PUC ruled that reserves to pay deferred taxes from rapid amortization must be listed "income" instead of "expenses" for future accounting.

HEROES—Daniel Carson, pilot of a helicopter owned by the Puerto Rico Water Resources Authority, is credited with saving more than 100 lives during the Hurricane Donna floods. He had the help of J. R. Raub, his supervisor; Fred Robart and George Matters, mechanics; Line Foreman Dolores Cruz Lopez, and Linemen Hector Pacheco and Melquiades Toro . . . **Robert D. Stieghorst,** Central Illinois Light Co, has received the National Safety Council President's Medal for saving the life of a fellow lineman. He applied mouth-to-mouth artificial respiration on a pole after Ralph Beckham was rendered unconscious by electric shock.

TROUBLE—Smoke from a burning transformer in Boston's subway system downed 50 commuters and 25 firemen. The system was tied up for more than two hours . . . **Result of an outage** on Georgia Power Co lines at Waycross was a roasted turkey. The unfortunate bird flew up on a secondary wire and shorted it against another . . . **Three times in one week** worried squirrels caused outages on the Narragansett Electric Co system. The squirrels, desperate because oak trees have not produced acorns this year, are using distribution wires as avenues for their food hunting . . . **Three thieves** sat in the Faulkner County, Ark., jail meditating their future after being caught soon after they chopped down a power pole and made off with 350 lb of copper wire. Arkansas Power & Light Co officials say it will cost $300 for repairs.

ELECTION DAY—Voters in Glasgow, Ky., will have an opportunity to decide whether the city will take over Kentucky Utilities Co properties. They turned it down in 1959 . . . **Asotin County, Wash.,** voters will say whether they want to take over water and electricity distribution facilities of Washington Water Power Co. This will be the first such vote in Washington since 1955 . . . **An initiative** facing Washington state voters Nov. 8 could affect Cowlitz River development by Tacoma City Light. The State Sportsmen's Council was successful in getting petitions preventing construction of dams on the river. Construction has already started on one dam.

Dateline . . . (*Continued from page 5*)

(**Louisville**—*continued*) area—not get too big."

Invariably, the biggest concern on both sides is providing the best service they can at the lowest possible cost. This fact alone seems to make the two groups close to 95% identical. They all seem to have a local identification as opposed to a national, and they seem to like to work together on loadbuilding campaigns.

But nothing makes a co-op man madder than the word "socialization," or any implication that a co-operative is anything more than a group of neighbors doing something for themselves. And a company man gets equally angry when the word "monopoly" is tossed out, or when there is an implication that he is part of "big business." Neither of these men feels that he is really competing with the other.

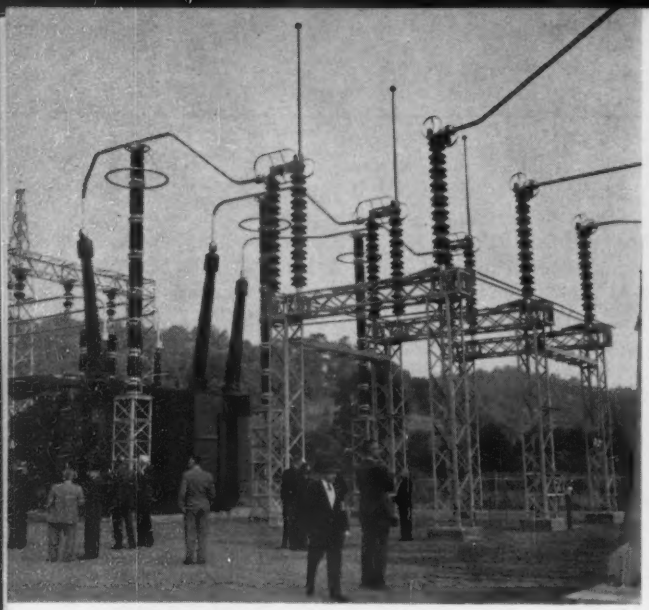
The 5% of remaining difference between the two groups is extremely important, if the conversations are reliable criteria. Defending low interest rates and some tax exemption puts the co-op man a bit on the side of government aid while the company man is nearly always opposed to it. It is an educated guess that no one alive today will live long enough to see this difference entirely eliminated.

Kentucky— Public power is an issue in the Senatorial contest in Kentucky but it's not a question of the candidates taking opposite sides. Both Senator John Sherman Cooper, the Republican incumbent, and former Gov Keen Johnson, his Democratic opponent, are claiming that each is a greater friend of TVA than his opponent.

Sen Cooper throughout the TVA region has campaigned with speeches noting that he first proposed the TVA self-financing bill in 1954 and helped draft the bill that was passed in 1957. Without it, he says, the big TVA power plant now being constructed at Paradise, Ky., could never have been built.

Johnson reminds his audiences that as governor in 1942 he sponsored legislation enabling cities and rural co-operatives to buy power from TVA. He charges that the Republicans have tried to wreck TVA.

In his opening campaign speech, Cooper took note of rumors that some private utilities would work to defeat him. He said he would take his "case to the people." Cooper is very popular in Kentucky and always has been the Republicans' top vote-getter. Johnson is not conceded to have much of a chance to unseat him.



CLAYSBURG TERMINAL of line houses 60-Mva, 460/115-kv three-phase transformer, 378-kv arrester, motor-operated 460-kv disconnect switch and 88-ft take-off structure

FOUR-POLE WOOD STRUCTURE here supports two 1.75 in. ACSR conductors 16 in. apart. Phase spacing is 24 ft. In background is Dunning Mt. (2,054 ft) one of two crossed

First US 460-Kv Line Energized

The first operational 460-kv transmission line in the US went into service in south-central Pennsylvania on September 30 on the system of the Pennsylvania Electric Co, a subsidiary of General Public Utilities Corp. Designed for a nominal rating of 460 kv, preliminary operation of the 13-mile line indicates that voltage as high as 505 kv can safely be carried. Thus it matches the voltage of any line now operating anywhere in the world.

The Penelec line, in planning since 1958 (EW, Jan. 18, p 47), was conceived to provide comprehensive full-scale tests of factors that might effect any future EHV transmission line design. During the next two years this prototype line will undergo extensive tests to obtain clearer understanding of stresses and strains, behavior effectiveness and cost of the design. President A. F. Tegen has already disclosed that GPU is planning to extend the line as a logical development of efforts to build "kilowatt turnpikes" from western Pennsylvania coal fields to the Atlantic seaboard.

Claysburg and Saxton in south-central Pennsylvania, were selected as terminals for the EHV line because between them lie two mountain ranges 2,000-2,250 ft high and a valley providing geographical and meteorological conditions representative of the territory. Here it is possible to test icing, snow, wind, lightning, and other varying conditions to develop construction suitable for any system location.

During the two-year test period both Penelec and several manufacturers will station full-time engineers on the line to make 460-kv tests covering the following areas:

1. Insulation design.
2. 60-cycle and power behavior.
3. Safety and psychological aspects.
4. Measurement of radio influence voltages.
5. Inductive and other coupling effects.
6. Lightning performance.
7. Feasibility of carrier uses.
8. Weather effects.
9. Effects of vibration.
10. Loss measurement.

Determination of the most economical combination of structures for 460 kv under widely varying geographical conditions was one of the primary objectives of the project. Five basic wood suspension structures, conventional steel towers, tubular steel structures, aluminum towers and laminated wood structures were studied. Studies were also made of R/W widths, insulator swing angles, tower combinations and configurations.

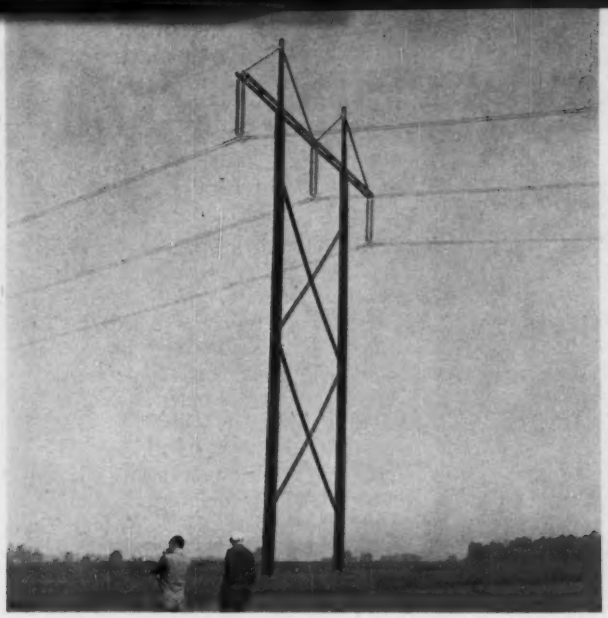
In the final line design 14 different type structures were used: three of wood, two laminated wood, three conventional steel, and six tubular steel. Aluminum towers were designed but dropped because of time limitations.

The steel towers of conventional configuration are of three types: two suspension designs of 16 and 18 tons each as well as one 30-ton dead-end structure.

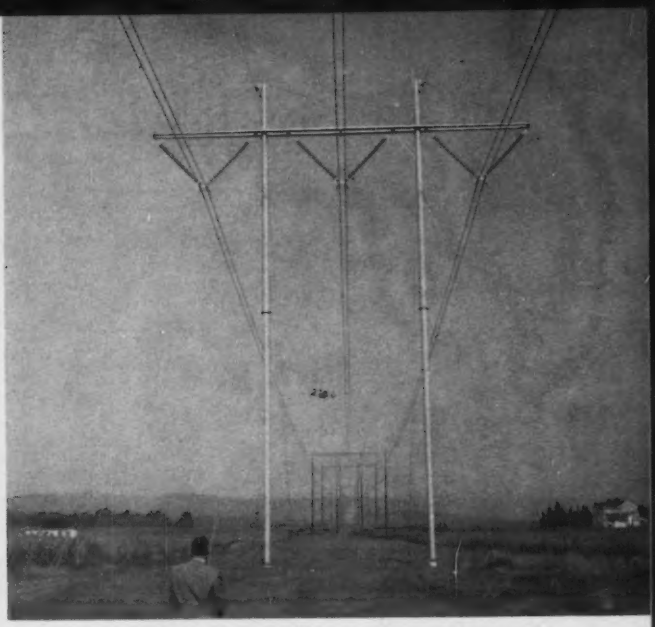
The wood structure adopted for the line is a four-pole structure of Class 1 poles with a transverse strength in excess of 35,000 lb. Vertical load at each conductor position is 8,000 lb and 1,100 lb at each shield wire.

Laminated wood towers of two types are used in the line. They are the first transmission structures entirely of glued, laminated wood. They weigh 13¼ tons and stand 127 ft high with 10 ft in ground.

Tubular steel structures are made of tapered steel tubes with a maximum dia of 21 in. They are of three types: conventional H-frames, portals, angle and dead-end structures. All types are guyed.



LAMINATED WOOD TOWER made from 2-in. douglas fir bonded with resorcinol resin into "I" beam section stands 127 ft high and weighs 13¼ tons. Two are used in line



TUBULAR STEEL STRUCTURES of H-frame, portal, angle and dead-end pattern use tapered steel tubes of 21-in. maximum dia. H-frame structures are pin supported, all are guyed

by Penelec

Erection of the line, which consumed 260 working days, involved tension stringing of five different expanded-core ACSR conductors (EW, June 20, p 88). One of these, with a 2.32 in. dia, is equal to the largest so far installed on an overhead transmission line. Average span of this conductor is 725 ft and its weight 2,447 lb between supports. Stringing was at tensions up to 10,000 lb using a 7-ton winch and tensioning machine with four neoprene-lined bull wheels.

Conductor accessories include twisted and Preformed armor rods, aluminum alloy suspension clamps, Armor-Grip suspension units, corona spheres and compression splices and dead-ends. On two conductor bundle sections, solid bar, coil spring and Preformed-type spacers are used.

Electrical protection of the line and transformers uses direct underreach and permissive over-reach transferred trip of the remote breakers. Transformer differential relays with simultaneous transferred trip of the remote breaker are used on the autotransformers. System overload protection is time over-current on the 460-kv transformers and it automatically places an existing 115-kv line in parallel.

Vital Statistics of Penelec 460-Kv Transmission Line

STRUCTURES—93 including 14 types

Material	Types in Group	Height
Wood	3	60-110 ft
Laminated wood	2	121-137 ft
Tubular steel	6	86-102 ft
Steel towers	3	126-130 ft

INSULATORS—Suspension string 15 ft long; BIL 1,835 kv

CONDUCTORS—Expanded-core ACSR, spaced 24 to 43 ft
1.75 in.; twin bundled @ 16 in.; 4.14 miles
1.60 in.; twin bundled @ 16 in.; 3.17 miles
1.4 in.; twin bundled @ 16 in.; 3.78 miles
2.32 in.; special single conductor; 1.9 miles

Rating—bundled 1.4 in., 1,788 amp; single 2.32 in., 1,590 amp

Surge Impedance Loading—750 Mva for 1.4-in. twin bundle

MAXIMUM DESIGN TENSION—55,000 lb per phase

Design Loading—NESC heavy loading; 1½ in. radial ice, vertical load only; 100 mph wind, no ice

Ground Wire—½ in. EHS steel, also 7 No. 6 Alumoweld

DISCONNECT SWITCHES—Rated 1,600 amp, 460 kv, motor operated; ground switches similarly rated, 17 ft long closed, 28-ft line spacing

LIGHTNING ARRESTERS—378-kv station type at each terminal

TRANSFORMERS—At Claysburg Sub, three-phase 60 Mva, 460/115 kv, 1,425 kv BIL; At Saxton Sub, three single-phase, 20 Mva, 460/115 kv.

Transformer Bushings—24 ft 7 in. on three-phase; 19 ft 8 in. single phase

STATION DEAD-END STRUCTURE—70,000 lb steel, 88 ft high

CONTRACTORS & SUPPLIERS

Aluminum Co of America; Copperweld Steel Co; Bethlehem Steel Co; General Electric Co; Hughes Brothers, Inc; I-T-E Circuit Breaker Co; Kaiser Aluminum & Chemical Co; Ohio Brass Co; Pennsylvania Transformer Div—McGraw-Edison Co; Preformed Line Products Co; Rilco Laminated Products Co; Union Metal Mfg Co; Day & Zimmerman, Inc; Sordoni Construction Co

Cylinder Cracking Follows Shift

Thermal stresses affect designs with integral steam chests and nozzle chambers for temperatures rising above 850F

WALTER SINTON, Manager-Medium Turbine Apparatus Section, Steam Division, Westinghouse Electric Corp, Lester, Pa.

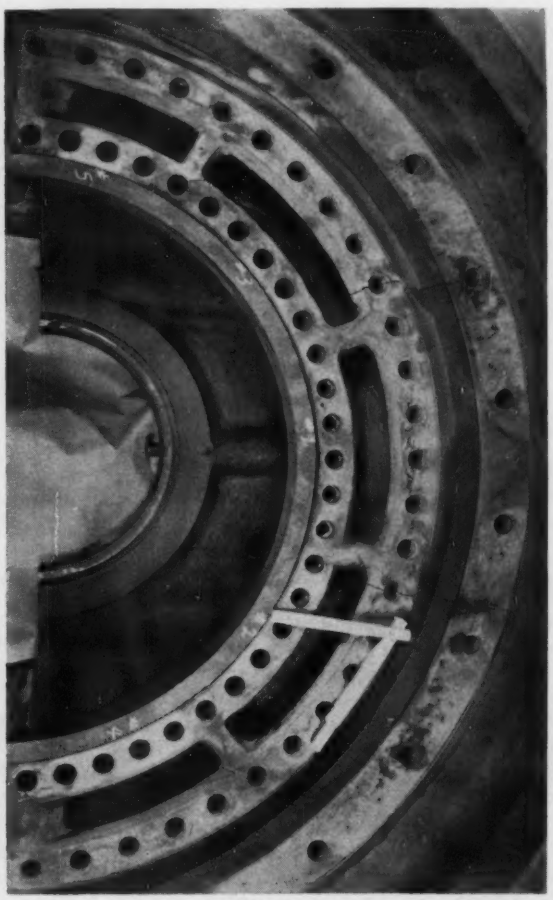
Cylinder cracking in older turbines has increased markedly in recent years, following their transfer from base-load to cyclic operation. This problem is industry wide, affecting the products of all steam turbine builders. The designs that suffer are those having integral steam chests and nozzle chambers.

These turbines performed successfully as base-loaded units for many years, but recently newer, more efficient reheat machines have been replacing them in this assignment. The replacements are designed for 1,000F and above and have separate steam chests and nozzle chambers, and flexible inlet piping. These features equip them for high-temperature operation. They are not prone to cylinder cracking because their individual nozzle chambers, unhindered by rigid attachment to adjacent cylinder parts, expand freely.

The construction of the older turbines lacks the flexibility of the separate-nozzle-chamber design. Such rigid integral construction is not a disadvantage in cylinders designed for operation at reasonably uniform temperatures or through occasional moderate temperature changes. Since cylinder materials can withstand fairly high stresses at temperatures below 950F, the integral construction had been an industry standard for the 25 years before the advent of the 1,000F turbine, whose design allows for flexibility between stationary parts.

But the thermal cycling of cylinder parts—a consequence of frequent stops, starts, and load changes

FATIGUE CRACK in cylinder flange caused by excessive stresses due to temperature cycling in an older machine



NOZZLE CHAMBER PARTITION is one area of turbine cylinder liable to cracking by temperature-induced stress

# of Older Turbines to Cyclic Duty

—imposes on the integral construction a severity of duty not heretofore required of it. Accordingly this cracking problem is essentially one of fatigue stress.

Experience with units in service has established the temperature range within which cylinder cracking can be expected. Some turbines with integral steam chest and nozzle chamber construction evidence cracking only when operating at 850F or higher inlet temperature. It occurs when they are subjected to load cycling and frequent shutdowns and startups. Other types of turbines suffer cracked cylinders in the same circumstances at inlet temperatures as low as 600F. The incidence of cracking becomes progressively higher at temperatures above 600F.

An inverted plan view of a typical cylinder cover of integral steam chest and nozzle chamber construction is shown in Fig 1. The horizontal joint flanges may be thought of as a pair of very stiff beams, restrained at their ends by attachment to the cylinder end walls and forced apart by the lateral expansion of the nozzle chamber structure at a point in the span of the beam. The dotted line shows the bending of such a beam due to a forced displacement, the bending stresses being greatest near maximum displacement.

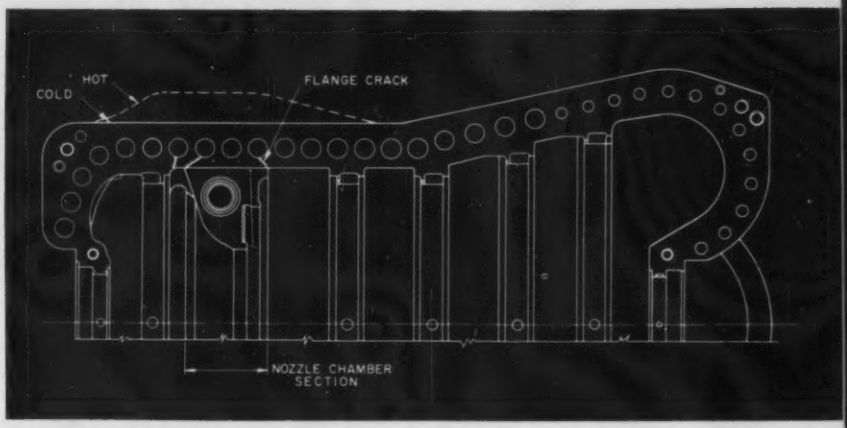


FIG 1—CYLINDER FLANGE is displaced resulting in large bending stresses in older-type turbines an effect of temperature differentials in cyclic operation

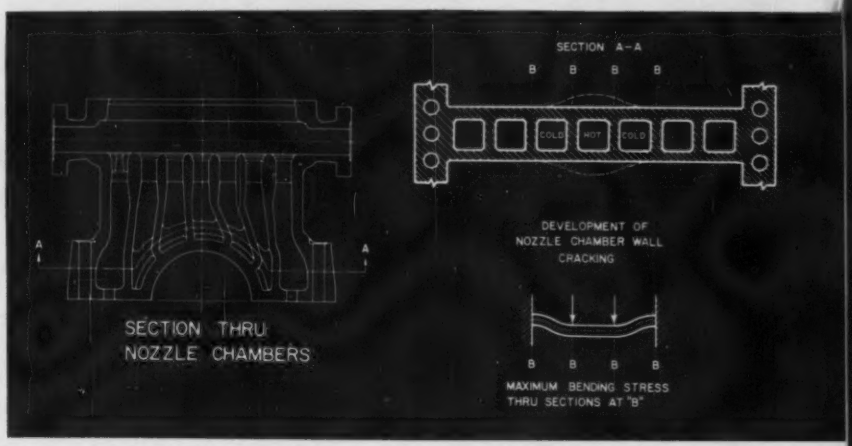


FIG 2—MECHANICS of stresses on nozzle chamber walls are shown in this section of flange of a circumferential section through the chamber structure

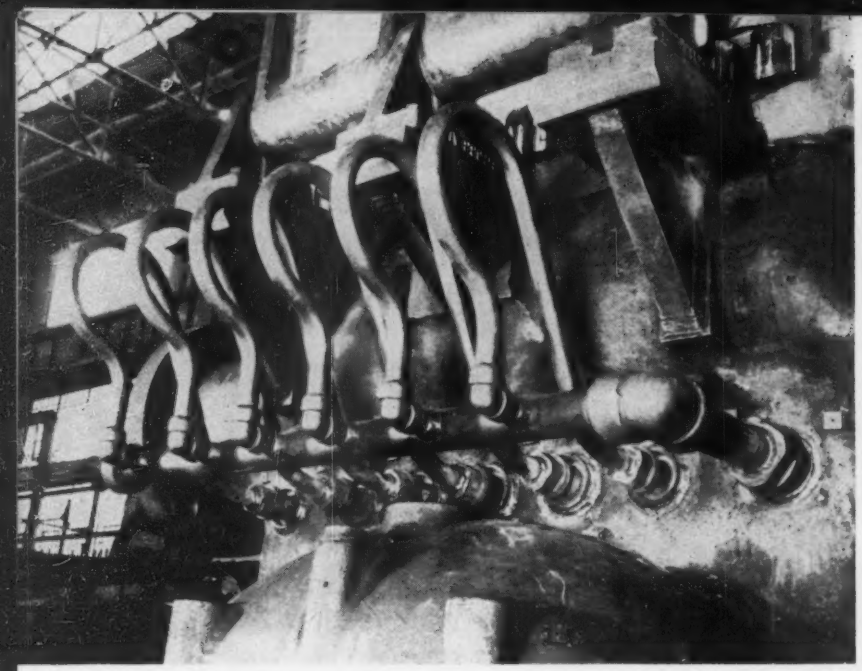
Stresses Are Limited

For short stiff beams subjected to large displacements, bending stress in excess of the yield point of the material can be calculated. In practice, plastic flow in the material limits the stresses to the yield point in a statically loaded structure. But after a number of cycles of loading and unloading, corresponding to expansion and contraction of the nozzle chamber structure through this large stress range, fatigue cracks may develop at points of stress concentration, such as the small radius at the junction of the flange and nozzle chambers.

Several such cracks have been observed when they had propagated well into the flange, as in left photo, p 46. The obvious corrective measure is to decrease the stress concentration by enlarging and smoothing the radius. This has been done with good effect.

Fig 1 and 2 show a developed view of a circumferential section through the nozzle chamber structure, as seen from below, and an accompanying diagrammatic sketch of the same type of beam bending encountered in the flanges. The chamber's front and rear walls constitute the beams, forced apart by expansion of the partitioning walls.

The most severe beam bending occurs at part load on the turbine when hot steam flows through one nozzle chamber, heating one pair of partition walls while the others remain relatively cool. After enough cycles of operation through various partial loads, the same type of fatigue cracks may develop at the junction of the chamber and partition walls, as in right photo, p 46. In this case, corrective measures, other than actual repair of cracks as they develop, are not as simple as for the flanges. Prevention consists of controlling temperature gradients and following proper oper-



NOZZLE CHAMBER HEATING MANIFOLD feeds supplementary steam to inactive chambers limiting temperature differences to obviate metallic stress cracks

ating procedures within the station.

When thermal cycling is recognized as the major cause of cylinder cracking, operation at reasonably constant load seems the obvious way to eliminate it. But in the class of turbines discussed load cycling is a necessary condition of operation. Relief from cracking can come from limiting the severity of this thermal cycling by any practicable means. Thus the life of the machine can be considerably extended by reducing the stress range through which the various cylinder parts function.

The rate at which load changes are applied to a unit governs the extent of internal temperature differences. These can be minimized by gradual application and reduction of load. The thermal cycling is still present, but the range of temperature differences, hence the range of stress, is materially reduced.

Rate-of-loading curves have been prepared, based on operating experience, the important criteria being the difference between steam and cylinder metal temperatures in critical areas. Fig 3 is such a curve for single-wall units without flange heating. When the curve is followed, operators have reasonable assurance of limiting serious temperature differentials.

Thermocouples Help

A better procedure is to bring temperature differences under the operator's direct control by installing thermocouples in critical areas, such as the steam chest wall and nozzle chamber partitions.

Nozzle chamber partition temperature differences can be limited to about 100F maximum by controlling the throttle steam temperature and the rate of loading the unit. Similarly, the maximum temperature difference between the horizontal flange and bolts should be limited to 250F for non-relieved flanges. A 200F maximum difference is recommended for relieved flanges.

These suggestions are made to operators for meeting these temperature-difference limitations in starting units:

1. The throttle steam temperature during the rolling period should range from 0F to 300F higher than the steam chest metal temperature.

2. During the loading interval, throttle temperature should range from 0F to 150F higher than metal temperature.

3. The rate of increase of throttle temperature should be limited to about 300F per hr when thermocouples are not used to check metal temperature.

4. A higher rate of change of throttle temperature, say 400F per hr, can be tolerated when thermocouples monitor temperature in partition walls, horizontal flange and bolts, etc., providing the prescribed differentials are not exceeded.

Supplementary heating steam fed to the inactive nozzle chambers

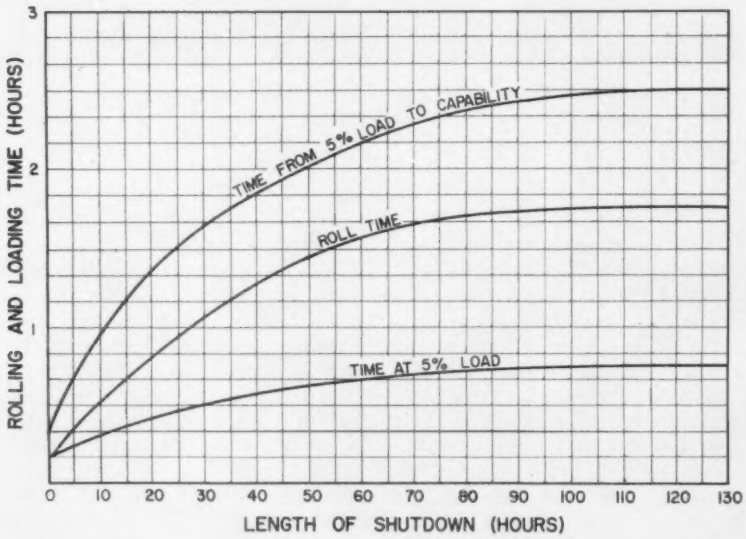


FIG 3—ROLLING AND LOADING TIMES for turbine as suggested for minimizing effects of temperatures and hence material stresses in cyclic operation

FIG 4—METAL TEMPERATURES obtained with auxiliary heating steam during start of integral nozzle chamber turbine minimize material stresses. This provision makes turbine better suited to higher-temperature cyclic operation

helps to limit partition wall temperature differences during load changing periods. Designs for heating manifolds are available for application to cylinders during scheduled inspections. Photo on opposite page shows a typical installation.

Tests were conducted on a 44-Mw ASME-AIEE preferred standard unit designed for 1,250 psig, 950F, which was equipped with a heating manifold. Thermocouples were installed in strategic locations to measure differentials across inactive partition walls. Fig 4 contains data obtained during a startup following a week-end shutdown. Note the low order of temperature differentials in partition walls during the loading cycle.

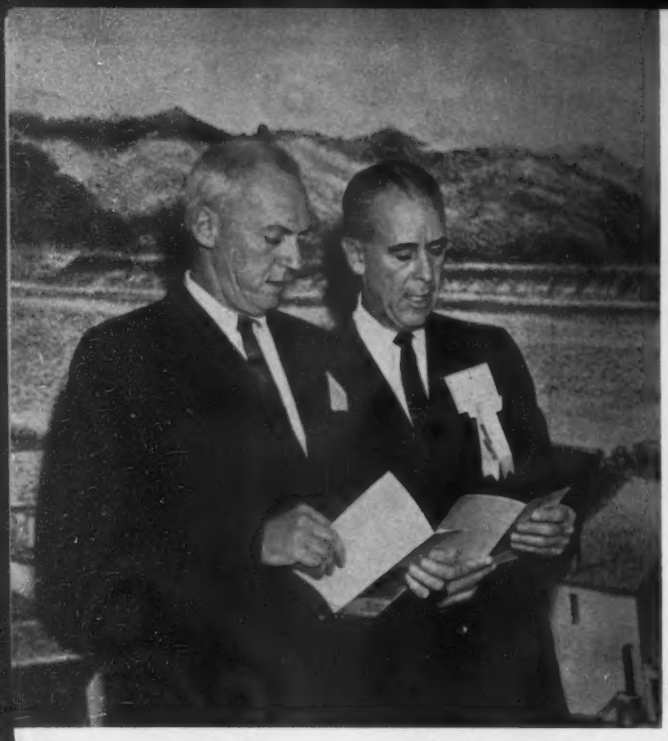
The tests indicate that heating steam quantities in the order of 3% of maximum throttle flow, if distributed through a manifold to the inactive nozzle chambers, keeps the differentials across the partition walls to about 110F maximum, thus reducing thermal stresses.

This manifold heating steam is always under governor control, as it is taken from the No. 1 valve chamber and distributed in sequence to the other nozzle chambers. This heating steam is directed to impinge on the metal strategically. A very small efficiency loss is entailed at low loads, as this steam does no work in the first stage of the turbine. At maximum flow and load, no efficiency is lost.

Units furnished with throttle-stop valves have this advantage: All governor valves remain open during the rolling period, permitting equal heating of the nozzle chambers. Speed is controlled by the throttle-stop valve until it approaches 3,200 to 3,300 rpm, at which speed the governor takes control, closing all but the No. 1 governor valve for synchronizing. From this point on, the nozzle chamber heating manifold reduces thermal gradients across inactive partition walls. It is also possible to load the turbine up to approximately 35% load with the throttle valve pilot, or bypass, controlling. All governor valves would of course remain open. Some reduction in load would then be required to open the throttle valve wide, and the governing valves would then take care of load variations. This permits further equalization of nozzle chamber wall temperatures.

The best solution to cylinder cracking is to provide flexibility in cylinder components subject to the higher temperature gradients and hence to greater thermal stresses. The 1,000F and higher inlet temperature units predicted on the concept of a separate steam chest, separate

(*Continued on page* 56)



Knapp, Vennard Launch RMEL Denver Talks

SHERMAN R. KNAPP, president, EEI and Connecticut L&P, (left) consults RMEL Pres R. T. Person, PS of Colorado

Cite subsidized competition as utilities' top problem; 57th workshop names P. E. Brookover to succeed R. T. Person

The Rocky Mountain Electrical League, holding its recent 57th workshop meeting at Denver, Colo., was told that government competition, subsidized through tax exemption, is the No. 1 problem of the investor-owned public utilities today. With this message, two Edison Electric Institute spokesmen launched the meeting program.

New Officers Named

R. T. Person, Public Service Co of Colorado, presided as 1960 RMEL president. The meeting elected P. E. Brookover, Cheyenne Light, Fuel & Power Co, as Person's successor. Vice presidents named were: M. G. Brennan, Stearns-Roger Mfg Co; Neil Simpson, Black Hills Power & Light Co; Veryl Hoover, Pacific Power & Light Co; and Warren Terry, Home Light & Power Co.

"If electric bills are the vehicle for tax collection, why should some electric bills be exempt?" asked Sherman R. Knapp, president of both the EEI and Connecticut Light & Power Co. "Four out of five of us who pay electric bills kick in 23¢ in taxes for every dollar on the bill. Why should that fifth customer, served by government power, not pay his fair share of the cost of government, of Polaris missiles and nuclear submarines, of schools and highways?"

Noting popular misapprehension of the nature of power companies owned by investors, Knapp proposed that such companies might be more surely described by the term "share-holder." He proposed this epithet to eliminate situations in which customers do not know whether they are served by a company or an agency of government. He suggested also as a means of driving home the nature of such companies that, in dealer campaigns, shares of stock be given as rewards for sales achievement.

Meeting Hears Vennard

Edwin Vennard, EEI vice president and managing director, also deplored discrimination against 80% of the people in favor of 20% in supplying electric power. Vennard spoke also of forecasts of load requirements by regions for 1970 and 1980 and declared that the investor-owned companies are fully capable of meeting such requirements, as they met them in the past.

Noting that rural electrification under REA had been accomplished, the speaker declared that the time had come when such government-subsidized activities should pay the full cost of money as well as their share of taxes. He noted that EEI recommends that power operations be separated from other TVA functions and be placed under the jurisdiction of an appropriate regulatory body and run fairly as a business, abiding by the same rules as other power enterprises.

Cites Election Survey

William M. Longman, president of Central Surveys, cited surveys of areas in which public power had been made an election issue by candidates, although the public did not seem to regard it as such. In the Pacific Northwest, as well as other places, where well known candidates were vocal in their advocacy of public power, vote results did not indicate that public power as an issue either elected or defeated them. Many voters, he said, had little interest or knowledge of the power issue.

"We cannot have both control of inflation and low interest rates at the

(*Continued on page* 156)

Political Speakers Address PEA

Governor Lawrence, Rep Saylor examine problems concerning utilities; industry speakers stress public service actions

Politics, public service and community problems were high on the list of subjects explored by speakers at the Pennsylvania Electric Assn's annual meeting in Pittsburgh on Sept. 21 and 22. Representatives from government and education joined industry figures in helping to extend utility horizons.

Governor David Lawrence of Pennsylvania congratulated the state's utilities for their contributions toward the Pennsylvania Industrial Development Authority while challenging them to redouble their efforts to attract new industry.

Unemployment Expensive

Unemployment has cost Pennsylvania $490 million more than it should have over the past seven and a half years, Lawrence asserted. "But today Pennsylvania has an industrial development program which is second to none," he pointed out.

"During the past four years," he continued, "companies have announced 389 new plants in Pennsylvania. They have announced more than 600 plant additions. Nearly 500 idle plants have been reopened and put back in operation. Most important of all, new factory jobs will run above 100,000 in times of normal industrial activity."

Some federal aid would be necessary, Lawrence admitted, to supplement Pennsylvania resources. But he emphasized that he did not want to involve Pennsylvania in a system of federal handouts.

On the other side of the political fence, Rep John P. Saylor, Republican of Pennsylvania, analyzed the status and probable future of power industry legislation before Congress. "Although some victories have been recorded, the trend of federal encroachment in the electric utility field has not been reversed in this past session of Congress," Saylor warned.

He cited Burns Creek as an example of a project where, under the guise of reclamation, the federal government would assume a public utility responsibility for a few preference customers. Although no action was taken in the past session, it is expected to be one of the first items on the agenda when Congress reconvenes.

"The most productive method of reversing the trend of federal encroachment is the election of candidates dedicated to the preservation of our liberties," Saylor said. Congressmen don't often hear from utility people when power issues are to be voted on, while public power advocates deluge legislators with letters, telegrams and other forms of pressure, he added.

Philip A. Fleger, Duquesne Light Co, examined the "power race" between the United States and Russia in his address of welcome to the delegates. At the end of 1959, US power capacity was 183 million kw —some 124 million more than the 59 million kw of Russia's capacity —and, although Russia has announced a goal of 110 to 112 million kw by 1965, by that time the US will have 245 million kw, increasing its lead to about 134 million kw.

"Therefore," he said, "we are convinced that we not only are far ahead of Russia in electric supply today but that we will remain so for the foreseeable future."

There is much more at stake than the interests of the electric industry, he noted. As a nation we appear to be facing a long, indeterminate period in which government will need huge sums for defense and for other phases of the apparently unceasing struggle with international communism.

"Surely we do the broad national interest a service in pointing out that over the next twenty years more than $143 billion for construction of electric company systems will come from the operation of our industry in a free enterprise economy —a burden that government need not and should not bear. And not only that, but over the next two decades the investor-owned electric companies will contribute nearly $102 billion in taxes to federal, state and local governments, more than half of this total to the federal government," Fleger said.

Appliance Survey Reported

Louis H. Roddis Jr, Pennsylvania Electric Co, outlined the results and analysis of a survey conducted by his company on appliance servicing and kwhr lost because of appliance outages. He challenged the utilities and manufacturers in-

INCOMING PRESIDENT G. R. Parry, Metropolitan Edison Co, at right, receives the president's pin emblematic of office from retiring president W. J. Lyman

REP JOHN P. SAYLOR

PHILIP A. FLEGER

LOUIS H. RODDIS JR

volved to join forces for a solution to rapidly worsening appliance servicing problem.

"It's past time to stop debating who is responsible for repair service, or lack of it," Roddis told the convention. "The time has arrived for everyone concerned to join in a mutual problem that grows larger in direct proportion to the increase in the complexity of automatic appliances and to the generosity of the repair service offered by the gas companies. There is no use saying the latter are giving away their shirts, because we have statistical evidence that they are making friends and creating customers for many years to come with their repair program."

Although the distributor and dealer have a monetary consideration, they always have the choice of selling something besides electric appliances—and many of them do, Roddis added. He said the manufacturers and utilities face the most direct loss of revenue.

An unparalleled research and development program is one of the key reasons why America's electrical industry has grown at a rate far exceeding any other industry in this country—and why it will continue to outstrip Russia in its drive for technological world supremacy, A. C. Monteith, Westinghouse Electric Corp, told delegates.

Referring to both utilities and manufacturers, Monteith said, "We must both support an intensive research and development program. . . . our industry was built on research, and has grown great through research and must continue its research to remain great. Our industry has the best-equipped, best-staffed and hardest working industrial research laboratories in the world concentrating on our problems.

"If we are truly diligent in research and development in all areas of the electrical power system, we can achieve the goals of improved technology and increased expansion we have set for our industry. At the same time, we can provide the nation with a model to follow in its search for greater and faster growth. . . . We can also do more than maintain the production gap between us and the Russians. We can increase it," Monteith said.

Dean E. A. Litchfield, Chancellor, University of Pittsburgh, made comparisons between American and Russian higher education based on personal experience and observations. Two reasons for Russian accomplishments, said Litchfield, are their efforts to educate women and the incentives provided so that almost no students of ability fail to go on to the university level.

In this country, he noted, 50% of the capable people do not continue their education. In only 16% of the cases is money the reason, compared with 42% who say they

(*Continued on page* 154)

TOP SAFETY AWARD went to Pennsylvania Electric Co, which had lowest accident frequency rate for companies working over million manhours. President Lyman presents the bronze plaque to Earl J. Miller, Penelec's Safety Director

GENERAL ELECTRIC LOWERS DISTRIBUTION TRANSFORMER OWNING COSTS WITH PREFERRED KVA RATINGS

GENERAL ELECTRIC

PREFERRED-KVA RATINGS OFFER . . .

5 ways to lower distribution transformer owning costs

Another significant step toward lower distribution transformer investment and operating costs

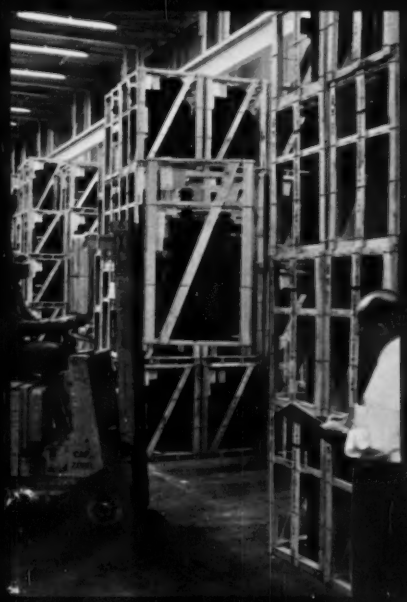
Lower Changeout Cost Use of preferred-kva ratings can lower changeout costs since more load growth can be absorbed. Based on a changeout practice of 150 percent of rating and an annual load growth of six percent, transformer replacement occurs on the average of every 7½ years. With preferred kva ratings, changeout would occur every 12 years, extending the transformer life-on-the-pole 4½ years.

Lower Operating Costs Distribution system operating costs can be lowered by using standard preferred-kva ratings. When preferred-kva ratings are used, the average transformer load is less, lowering total losses. Lower copper losses more than compensate for increased core losses. Also since voltage regulation is related to copper loss, use of General Electric's preferred-kva ratings also means better voltage regulation.

General Electric's preferred-kva distribution transformer program offers you five important ways to lower your total owning costs of distribution transformers. The preferred-kva concept is based on an extensive survey made among representative utilities across the country. The majority of those interviewed preferred standardizing on these **55° ● 65°** transformer ratings: 5/5.6, 10/11.2, 25/28, 50/56, 100/112, and 167/187 kva.

By standardizing on these preferred-kva transformer ratings from General Electric, you can own the highest quality transformers at lower total owning cost than ever before possible.

Before you buy another transformer, let your G.E. Sales Engineer show you how you can lower your distribution transformer owning costs with preferred-kva ratings from General Electric.



Lower Inventory Cost You can reduce your transformer inventory costs by standardizing on preferred-kva ratings. For example, if present maximum stock requirements are 20 15-kva units and 35 25-kva units, a total stock of 55 transformers is required. Standardizing solely on the 25-kva rating, total stock could be lowered to 44 units because of the diversity of need.

Simplified Procedures Standardizing on preferred-kva distribution transformer ratings lowers the cost of such overhead items as ordering, record keeping and financial procedures. Simplifying these procedures plus simplification of transformer application methods helps lower your total owning cost of General Electric distribution transformers even further.

Lower Initial Price In addition to the other factors which contribute to lower distribution transformer owning costs, General Electric recently lowered the initial price of preferred-kva transformers as much as five percent.

This action was taken to reflect manufacturing cost savings which result when utilities support this program by volume purchases of fewer kva ratings.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Cylinder Cracking Follows Shift of Older Turbines (*Continued from page* 49)

nozzle chamber construction with flexible inlet piping, have been free of cracks caused by cyclic service. This type of construction is illustrated in Fig 5.

The results obtained with "1,000-F type" separate-nozzle-chamber designs led to development of a new concept in cylinder construction. In this new concept, the flexible features can be incorporated in smaller units without expensive and complex separate steam chests and inlet piping. This future line of units is rated 22 Mw and up and is designed for inlet temperatures of 850 to 950F.

Can Be Cast as Unit

Steam chest and nozzle chambers will be cast as a unit, but a slot separating groups of nozzle chambers will allow expansion in service. This separate unit will be welded into an opening in the cylinder cover, which will be cast as a simple shell. This design permits two arrangements of "insert type" steam chest and nozzle-chamber units, one for admission of steam to the upper half only, as illustrated in Fig 6 and another for admission in both the upper and lower halves. Both arrangements provide for six inlet control valves in two groups of three valves each, separated by a slot to facilitate expansion as the nozzle chambers are heated and cooled during operation.

As the nozzle chambers will be separated from the cylinder walls near the horizontal joint flanges, restraint on expansion is minimized. At the section of the cylinder adjacent to the steam chest, horizontal joint flanges will be arranged for stud bolts tapped into the cylinder cover and projecting through the cylinder base. The design precludes machining into the weld joining the steam chest insert and the cylinder shell. Other horizontal joint bolting will be conventional.

There is provision for further limiting temperature differentials between individual nozzle chambers. Auxiliary heating steam manifolds will be cast integrally into the steam chest insert and cross-drilled to afford small-orificed flow quantities to adjacent chambers in each group.

This arrangement provides for heating these chambers as a group. As there is considerable flexibility between the two groups of passages through their separation by a slot, it is not necessary to heat the No. 4 passage before the No. 4 control valve opens.

Casting the steam chest nozzle chamber separately from the cylinder brings advantages to each, such as sounder castings and ease of inspection and repair. These advantages tend to insure a better ultimate product. Castings are sounder because the arrangement permits the utilization of more desirable foundry practices and techniques which, in turn, assure better feeding of molten metal during pouring and solidification. The "insert-type" cylinder design feature can be applied to existing units.

A severely cracked cylinder cannot be completely weld repaired and stress relieved without going back to the factory. This would require a long and costly outage to the user because of the uncertainties in effecting a major repair by welding and remachining. Such outages could be as long as nine months. Although the cylinder, when repaired, would probably be as good as new, it would still lack the flexibility inherent in the "insert-type" design.

Outage Time Shorter

The outage time would be considerably reduced were the user to order a replacement cylinder of the new design. Outage of the unit could then be scheduled to match completion of the new high-pressure cylinder. The rotor blade rings and certain other parts would be returned to the factory for fitting to the HP cylinder. For a single-case unit, the low-pressure cylinder would also be returned for fitting to the new HP cylinder.

The overall time of such an outage is predictable and in most instances, would probably not exceed three to four months. This approach gives the user a modern cylinder of the latest design and materials.

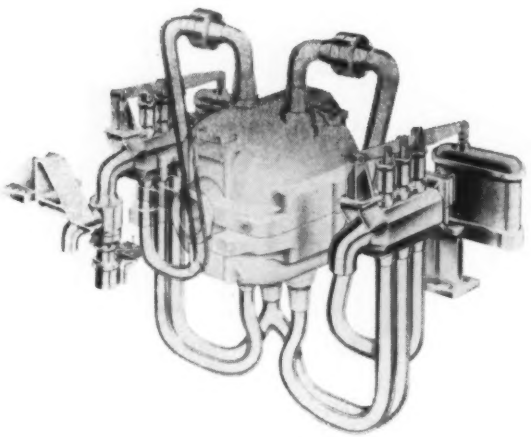


FIG 5—STEAM INLET FEATURES of 1,000F designs include separate steam chest and separate nozzle chamber

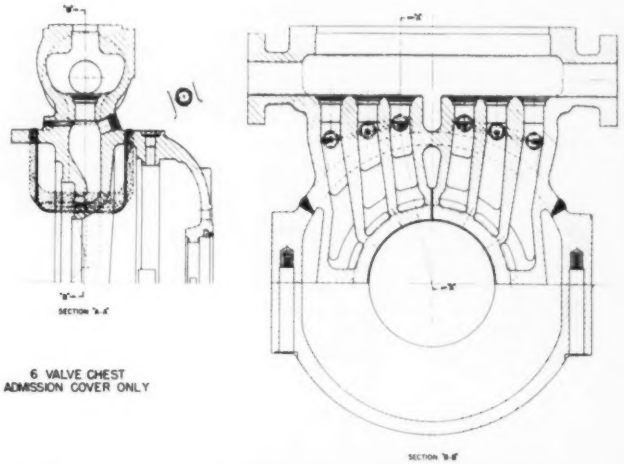
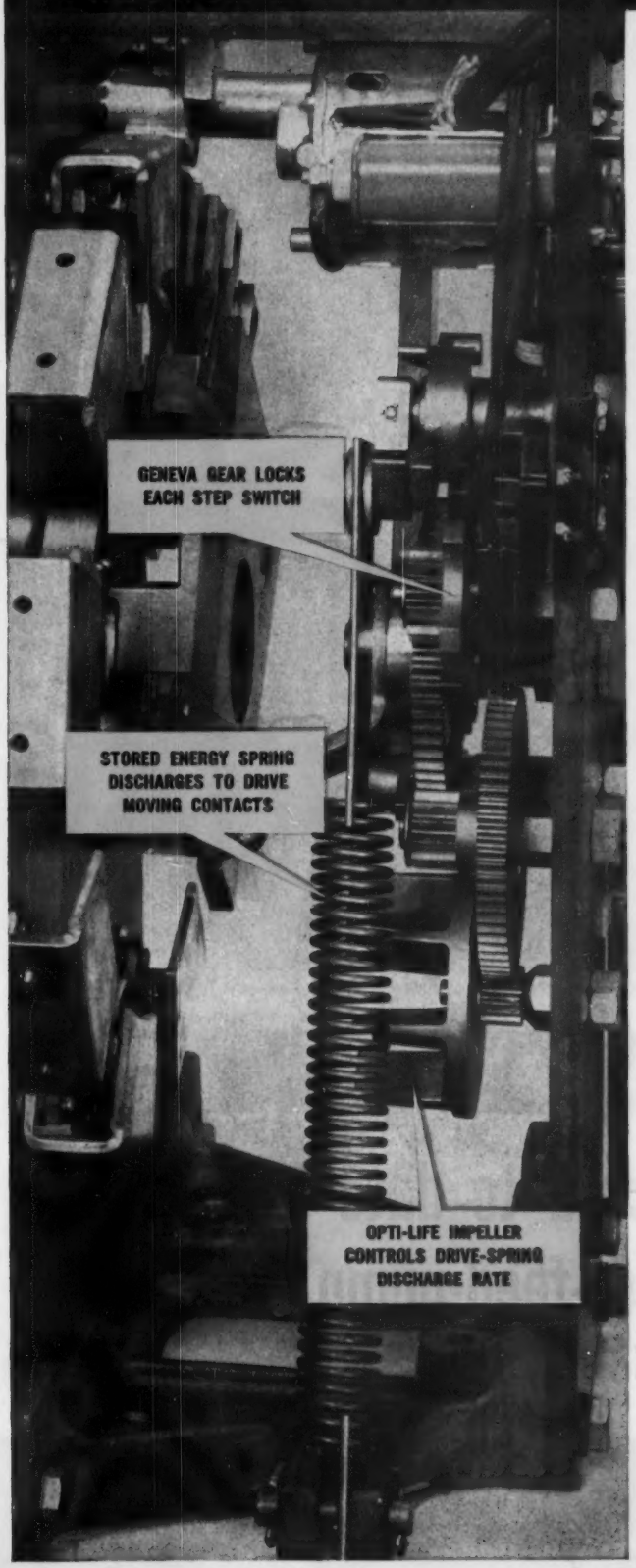


FIG 6—CYLINDER with steam chest-nozzle chamber insert permits much greater flexibility of steam inlet features

ANOTHER STEP AHEAD IN VOLTAGE REGULATION


GENEVA GEAR LOCKS EACH STEP SWITCH
STORED ENERGY SPRING DISCHARGES TO DRIVE MOVING CONTACTS
OPTI-LIFE IMPELLER CONTROLS DRIVE-SPRING DISCHARGE RATE

CONTROLLED REGULATOR SWITCHING SPEED

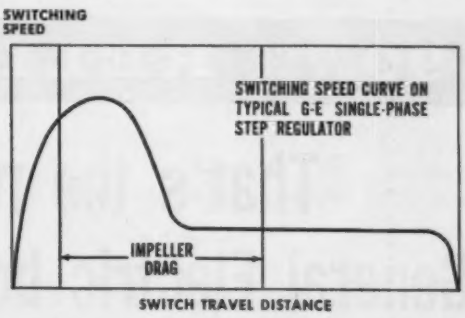
General Electric voltage regulator switches operate 20 years without inspection . . . give you maximum contact life

As regulator users know, there is an optimum tap-changing speed for maximum contact life. Optimum speed must be *controlled* and *non-linear.*

General Electric's exclusive Opti-life switch satisfies these requirements. Results: contacts "break" fast to reduce arcing. Contacts "make" at a calculated rate to (1) reduce mechanical abrasion of contacts, and (2) reduce arcing from contact "bounce."

Truly *controlled* speed of General Electric Opti-life switches is achieved by a fast-action drive, *plus* an oil-immersed impeller which dampens switch velocity as contacts close.

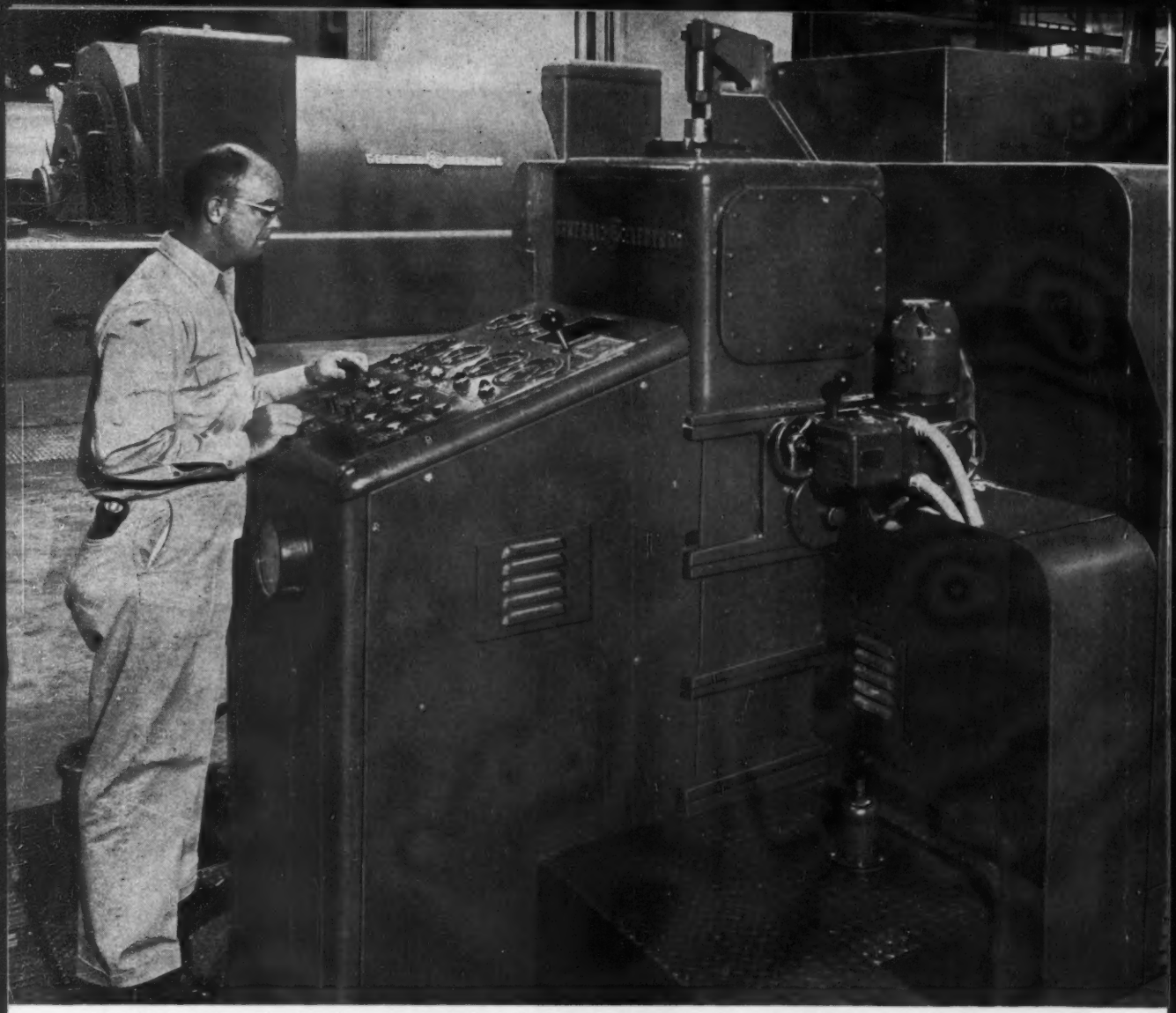
Benefits to you: maximum contact life. In fact, it *isn't necessary to periodically inspect* the interior of a General Electric ML-32 regulator. Under normal operation, switch inspection shouldn't be necessary *for at least 20 years.* You save money!


SWITCHING SPEED
SWITCHING SPEED CURVE ON TYPICAL G-E SINGLE-PHASE STEP REGULATOR
IMPELLER DRAG
SWITCH TRAVEL DISTANCE

FOR MORE REASONS WHY G-E regulators cost less on the line—see your General Electric regulator representative. Or, write General Electric Company, Section 456-05, Schenectady 5, N. Y. *Voltage Regulator Product Section, Pittsfield, Mass.*

Progress Is Our Most Important Product

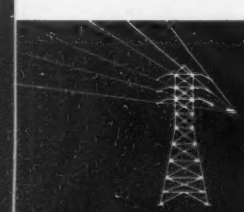
GENERAL ELECTRIC



Boiler-feed-pump turbine and main turbine-generator rated 175,000 kw at Dickerson Station, Potomac Electric Power Co.

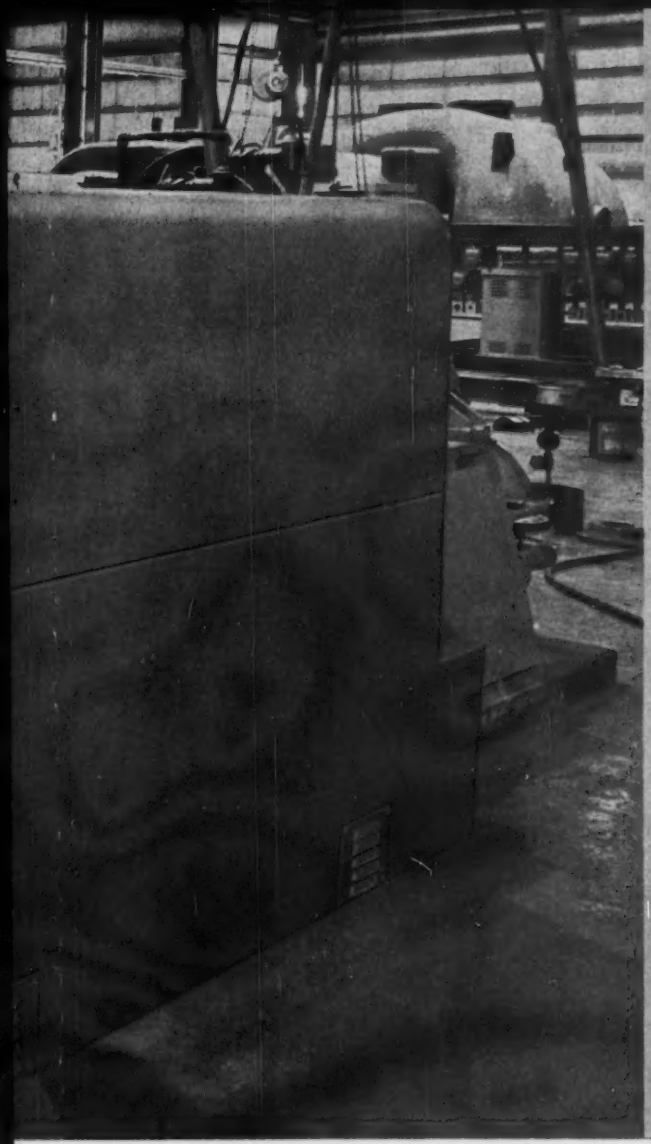
99.7% RELIABILITY

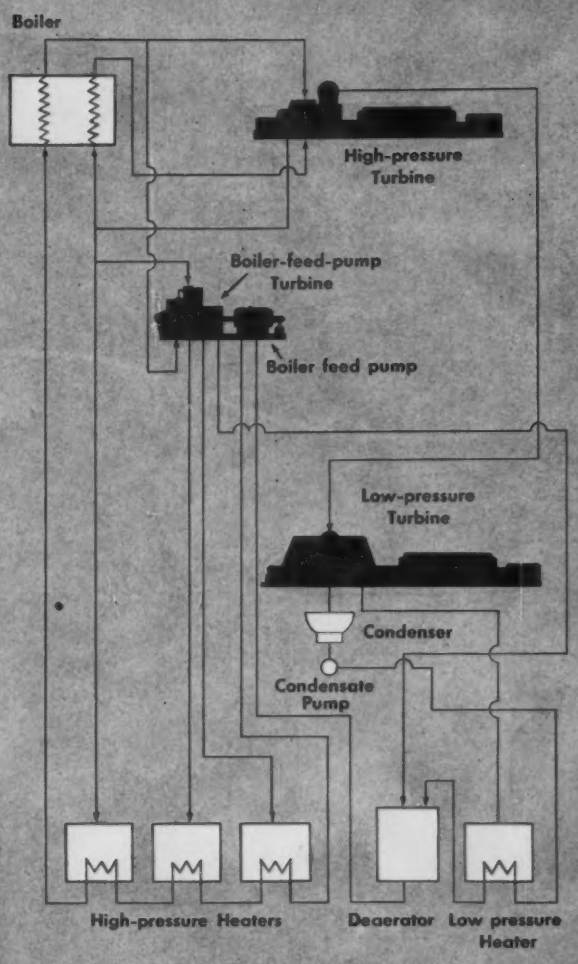
That's the record to date for General Electric boiler-feed-pump turbines



General Electric Turbine-Generators Help Keep Power Costs Low

Large steam turbine-generators for base load— 100,000 kw and up





General Electric boiler-feed-pump turbines can be adapted to a variety of steam cycle arrangements. Cycle arrangement above shows non-condensing boiler-feed-pump turbine. Majority of arrangements use extraction-type boiler-feed-pump turbines to share feed-water heating load with main turbine.

Five major electric utilities* have had a 99.7% reliability record to date with General Electric turbine drives for boiler feed pumps.

This in-service availability was achieved by the first 17 units put into operation, and represents the total number of boiler-feed-pump turbines installed by the General Electric Company to date.

Driving boiler feed pumps in large central stations, these units have a combined total of more than 23 turbine-years of operation—yet forced outage has, to date, amounted to less than 15 days.

This 99.7% reliability record is the result of General Electric's long association with the electric utility industry—working with utilities in designing and building equipment to meet their needs for generation station efficiency.

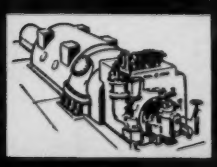
To improve station efficiency and increase net saleable kilowatts, specify General Electric turbine drives for your boiler feed pumps. Fourteen utilities have, since 1957, for a total of 44 units ordered.

For more information, contact your General Electric Sales Engineer, or write for Bulletin GEA-6541, Section 241-14, General Electric Company, Schenectady 5, N. Y.

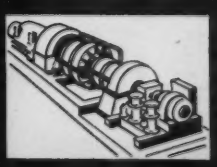
** Names of utilities will be furnished upon request.*

Progress Is Our Most Important Product

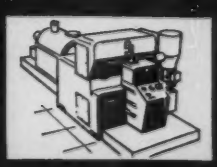
GENERAL ELECTRIC



Medium steam turbine-generators for base load—100,000 kw and down



Gas turbines for peaking, combined steam-gas cycle, and base load



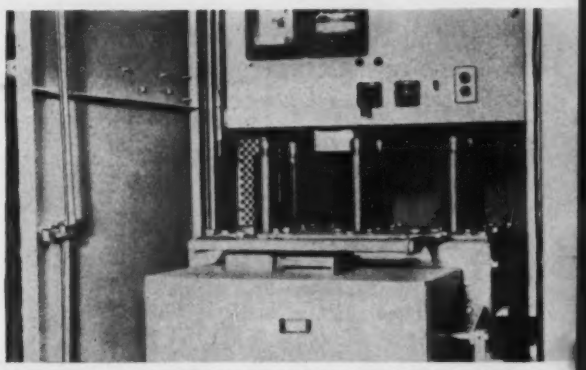
Mechanical drive steam turbines for boiler feed pumps and other auxiliaries

if you need **SIMPLIFIED MAINTENANCE** *you need...*

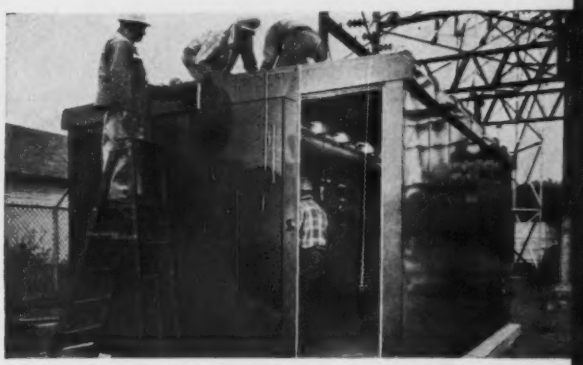
ECONOMICAL General Electric Master Unit Substations

ECONOMICAL G-E MASTER UNIT SUBSTATIONS are designed for easy and less frequent maintenance. The unit pictured here is in service for Jersey Central Power and Light Company.

TRANSFORMER MAINTENANCE is simplified by recessing indicators and making accessories easy to get at even when the equipment is energized.



GENERAL ELECTRIC VERTICAL LIFT Metal-clad switchgear is safer. You can see when the primary disconnects are parted. Maintenance can be performed by one man.



INDOOR MAINTENANCE of outdoor gear is possible with General Electric's protected aisle arrangement. This aisle is wide enough for two breakers to pass side by side within the structure.

After initial equipment cost, routine maintenance and inspection is the largest single substation operating expense. That's why General Electric transformers and metal-clad switchgear are designed and coordinated to afford top maintenance economy.

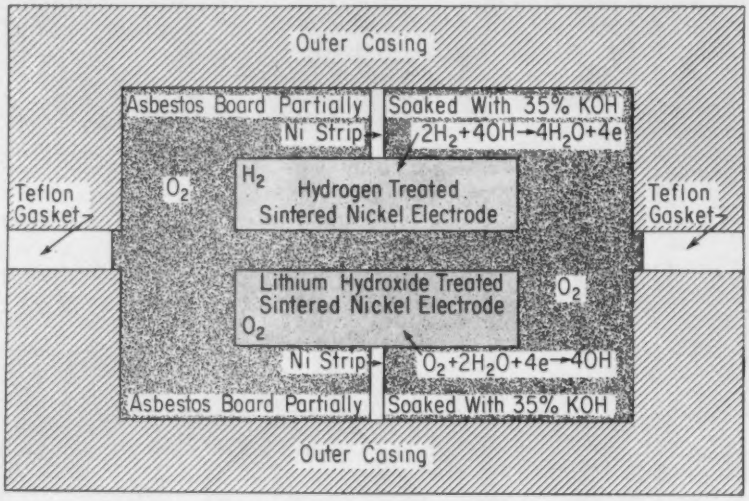
General Electric "Certified Full Value" transformers, for example, are ruggedly constructed and carefully painted to minimize maintenance. "Control center" accessory and indicator location speeds maintenance, and new load-tap-changer design cuts both noise and wear.

In addition, Vertical Lift Metal-clad switchgear maintenance—on both indoor and outdoor designs—has become a one man job. With instruments and relays now located conveniently above the breaker, routine maintenance can be performed quickly, easily.

Consider these maintenance benefits when planning for future system needs. For more information, contact your nearest General Electric Apparatus Sales Office or write for bulletin GEA-3800D, General Electric Company, Schenectady 5, New York. 512-35

Progress Is Our Most Important Product

GENERAL ELECTRIC



New H_2-O_2 regenerative fuel cell . . .

Promises Greater Efficiency

An experimental model of a lightweight, regenerative fuel cell with reported charge/discharge efficiency in excess of 50% was introduced recently by Electro-Optical Systems, Inc, Pasadena, Calif. The National Aeronautics and Space Administration will support further engineering development and evaluation of the device.

According to EOS, the fuel cell has high output and low weight, and is not expected to deteriorate as rapidly as battery-type storage units do after a few hundred cycles.

The cell utilizes a mixture of hydrogen and oxygen and features a partially saturated, non-conducting porous bed which runs between and beyond an anode and cathode (see illustration). This is the key to the cell's efficiency, points out EOS. The aqueous electrolyte solution, only partially saturating the bed, eliminates flooding of the electrodes, permits uptake and discharge of water, as required.

EOS says its new cell should provide 15 to 75 whr/lb, citing as comparison nickel-cadium batteries developed to date which store less than 5 whr/lb after thousands of cycles.

Compared with other hydrogen-oxygen devices of a similar nature which have been reported, says EOS, its fuel cell operates at 100 amp per sq ft at 0.55 v and efficiency of over 50%, whereas others operate at 25 to 50 amp per sq ft at 0.4 v and efficiency of about 25%.

More Bushing-Mounted LTC Equipment Specified

More and more utilities are showing a trend to order power transformers equipped with bushing-mounted load tap changers (LTCs) says the manufacturer, General Electric Co. Since 1957, 21 orders for autotransformers, 120 Mva and larger, with voltages above 69 kv, have specified bushing mounted LTCs, whereas only six such units had been shipped prior to that. Four 300-Mva, 230-kv units are largest shipped to date; two 345-kv, 200-Mva units are on order for 1961 delivery.

MANUFACTURERS BRIEFS

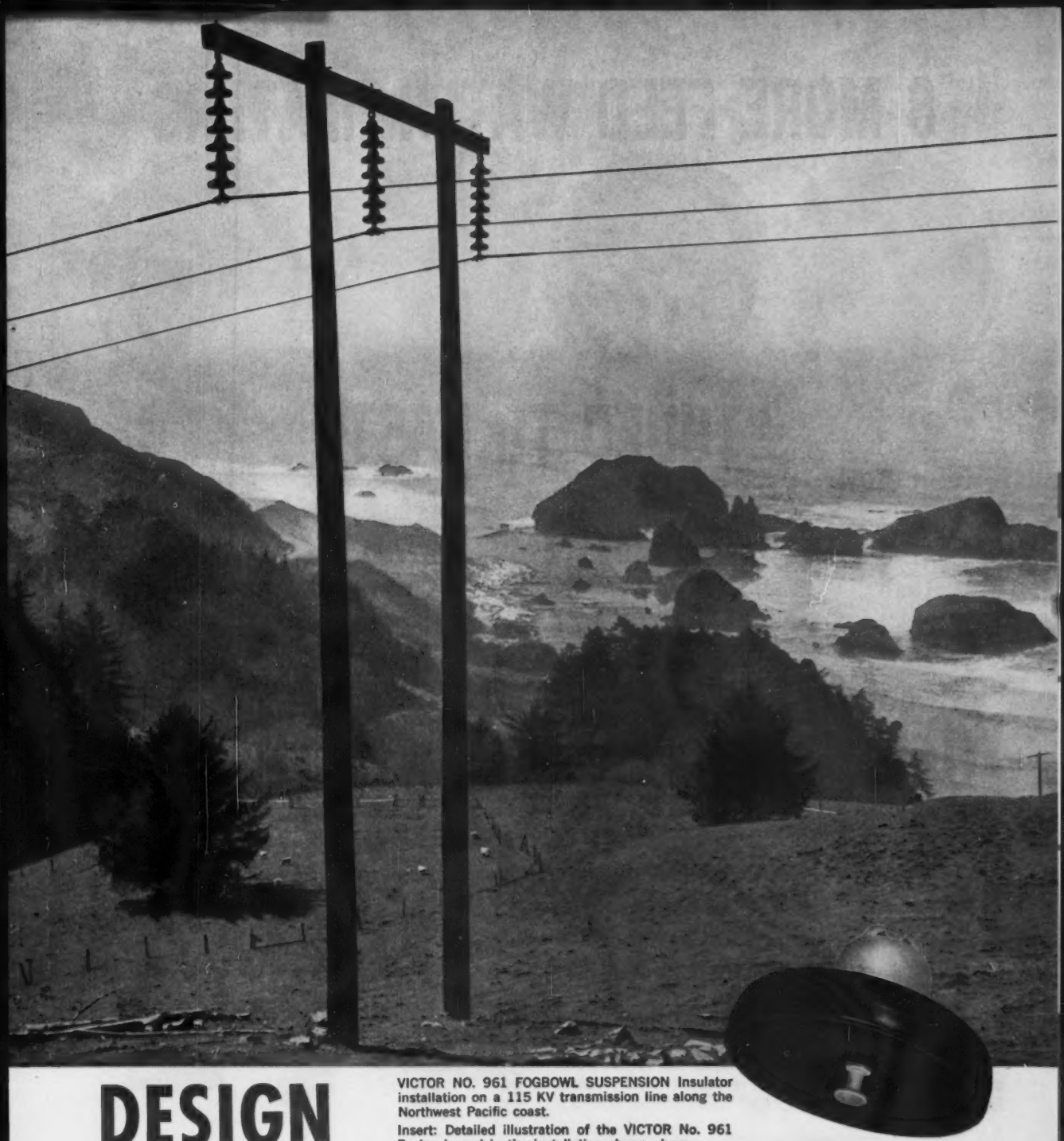
• **National Electrical Manufacturers Assn** will cosponsor with **Edison Electric Institute** the Industrial Electrification Council, effective Jan. 1. The council, which previously was sponsored by EEI and several individual manufacturers, has broadened its scope to include factory electric distribution systems. It formerly was concerned, primarily, with industrial uses of electric heat.

• **General Electric Co's** Chairman Ralph Cordiner reports general softening of prices is reflected in a third-quarter 20% net profit decline, compared to same period last year. Sales showed decline of 4% and backlogs were up 12% at close of third quarter this year, compared to those of same period in 1959. Third-quarter net profit was $57,506,000 on sales of $1,030,524,000. Cordiner notes the total electrical industry is operating "at not much more than half capacity, reflecting both expanded capabilities of major producers and the entrance of so many new competitors in this field."

• **National Electrical Mfg Co** is established in Greenville, Ala., by Bethea Co, as a wholly-owned subsidiary which will sell only to other manufacturers. Product line will include items for the switch and transformers terminal field.

• **Burndy Corp** forms jointly-owned Mexican corporation with Ingeneria Electrica Industrial. New firm, Burndy I. E. I., will make and sell Burndy products throughout Mexico and Latin America.

• **Tennessee Valley Authority** announces it will open bids on Nov. 15 on an 800-Mw cross-compound generating unit. On foreign bids, a 20% differential will be added. Operation of unit is planned for Oct. 1, 1964, and option on second unit is included in invitation.



DESIGN

VICTOR NO. 961 FOGBOWL SUSPENSION Insulator installation on a 115 KV transmission line along the Northwest Pacific coast.

Insert: Detailed illustration of the VICTOR No. 961 Fogbowl used in the installation shown above.

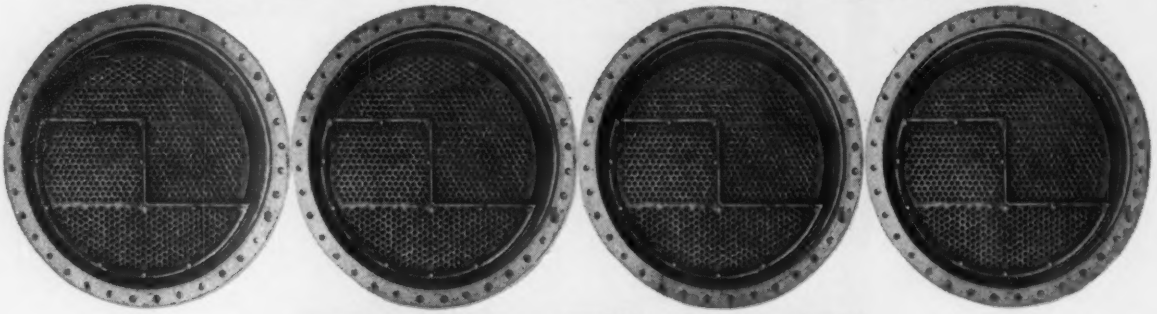
VICTOR has done more constructive research on insulators for contaminated areas than any other manufacturer in the field. Dramatic proof is the creation of the already famous No. 961 Suspension shown above.

Here is an entirely new concept in fogbowl insulator design . . . a totally different but effective answer to the problem of insulating in areas suffering from the contaminating effects of salt-laden air, fog, smog, dust, chemical or industrial fumes.

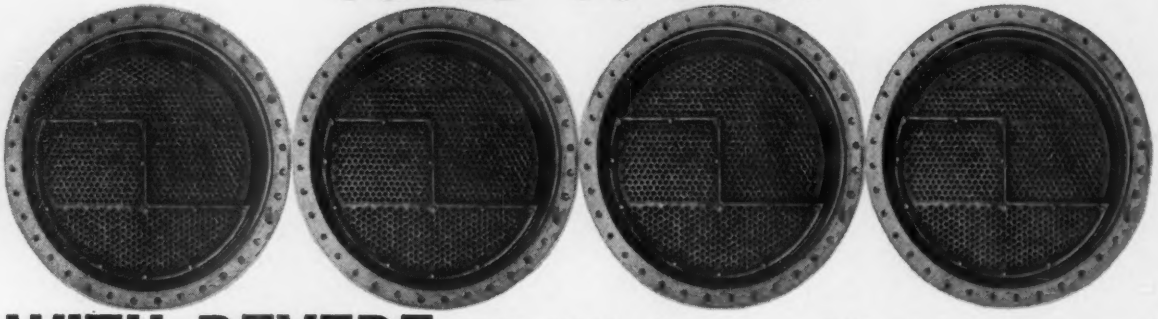
VICTOR No. 961 fogbowl suspensions were selected for this installation after exhaustive field tests conducted over a period of years on many makes of both conventional and fogtype insulators. The customer reports perfect service after years on the line . . . **with no expensive insulator washing.** Look to VICTOR when you have a contamination problem. For catalog, specifications and prices, contact your nearby VICTOR Sales Office. Victor Insulators Division, I-T-E Circuit Breaker Company, Victor, N. Y.

I-T-E CIRCUIT BREAKER COMPANY

8 MORE FEED WATER HEATERS



"TUBED TO LAST"



WITH REVERE 70/30 Cupro-Nickel Tubes

These Units for Cherokee Station Unit #2 of Public Service Company of Colorado were fabricated by YUBA Heat Transfer Division, YUBA Consolidated Industries, Inc., Honesdale, Pa.

Because there are so few sets of operating conditions that are exactly alike, each tube installation poses its specific problem which must be studied before a satisfactory recommendation can be made. In this installation of 8 feed water heaters, the specific set of conditions called for dual gauge tubes of 70/30 Cupro-Nickel. Tubes of dual gauge were used in order that uniform wall thickness be maintained after bends had been made.

This selection was made as a result of the collaboration of YUBA Engineers and Revere's Technical Advisory Service. It is this Revere Service, with its experience covering many and varied types of problems, that has been instrumental in prolonging tube life in power plants both large and small.

Why not take advantage of this storehouse of knowledge and contact Revere before making the final selection of tubes and plates for your equipment?

8 TUBE BUNDLES like this consumed 47,000 lbs. of Revere 70/30 Cupro-Nickel Dual Gauge Tubes.

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

Mills: Rome, N. Y.; Baltimore, Md.; Chicago, and Clinton, Ill.; Detroit, Mich.; Los Angeles, Riverside and Santa Ana, Calif.; New Bedford and Plymouth, Mass.; Brooklyn, N. Y.; Newport, Ark.; Ft. Calhoun, Neb. Sales Offices in Principal Cities. Distributors Everywhere.

INTEGRAL FINNED TUBE • BIMETAL TUBE • DUAL GAUGE TUBE • INSTRUMENTATION TUBE • CONDENSER TUBES IN CUPRO-NICKEL, ALUMINUM BRASS, ADMIRALTY, HERCULOY, ARSENICAL COPPER, MUNTZ METAL AND OTHER ALLOYS • ALUMINUM TUBE, SHEET AND EXTRUSIONS • SMALL AND LARGE PLATES IN CUPRO-NICKEL, COPPER, HERCULOY, MUNTZ METAL, NAVAL BRASS AND ADMIRALTY.

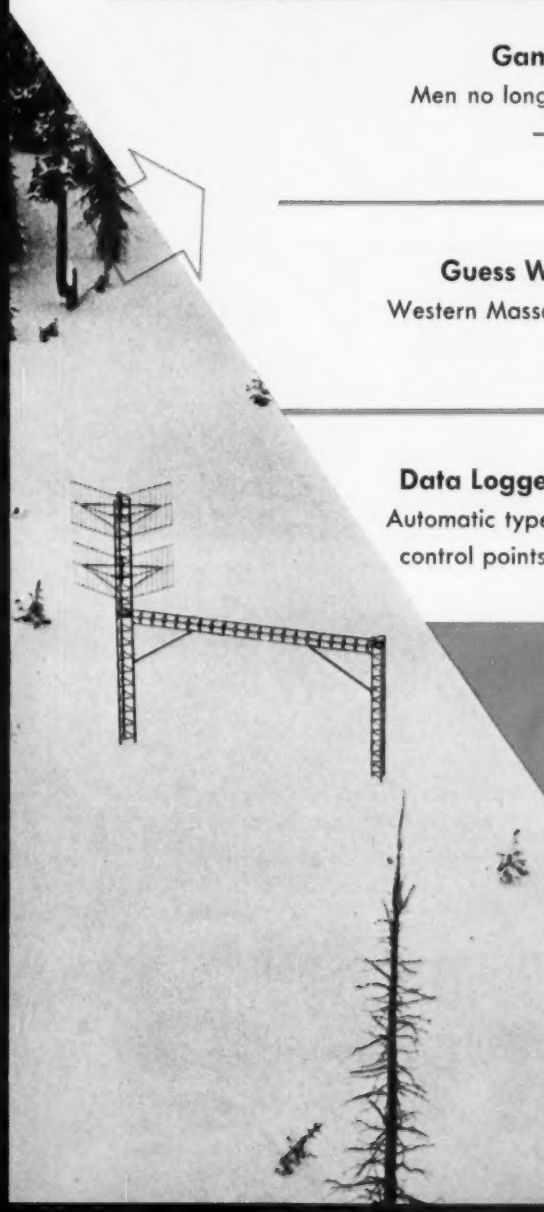
Electrical World Report

SEPTEMBER
OCTOBER

1960

ELECTRIC utility methods

CONSTRUCTION • OPERATION • MAINTENANCE



Gamma Rays Gauge Snow-Cover Water Content
Men no longer need treak to mountains to measure snow depth —snow gauge system telemeters water content data. p 82

Guess Work Taken Out of Oil Circuit Recloser Testing
Western Massachusetts Electric eliminates 'approximations' in conditioning and maintaining oil circuit reclosers. p 84

Data Logger Helps Protect Turbines, Reduces Manpower
Automatic typewriter intermittently logs 50 gas turbine operational control points—continuously scans all points for alarm conditions. p 86

Regular Departments

Construction p 90
Operation & Testing p 94
Maintenance & Repair p 100
Stores & Shops p 108
Safety p 112

New Equipment p 67
Manufacturers
Literature p 116

in the field

The Aransas Pass Test Line of Central Power & Light Co. consists of 200 foot test spans from which new tap connections are made periodically on weathered run conductor and current cycled.

...and in the lab

Inside view of a Burndy Salt Spray Corrosion Test shows what happens to connectors and cables of dissimilar metals when exposed to severe atmospheric conditions.

BURNDY RESEARCH

CONCENTRATES ON THE DEVELOPMENT OF BETTER ELECTRICAL CONNECTIONS

Burndy's field research with Central Power & Light on weathered overhead lines is expected to provide valuable information on connector installation practices, and possible data for the future design of connectors and cables with longer and more predictable life spans.

Burndy's research has produced: Massive Aluminum Tap—TAPIT®; Single Sleeve ACSR Splice—UNISPLICE™; Pre-insulated Service Entrance Splice—INSULINK®. Burndy research will continue to concentrate on the development of better electrical connections.

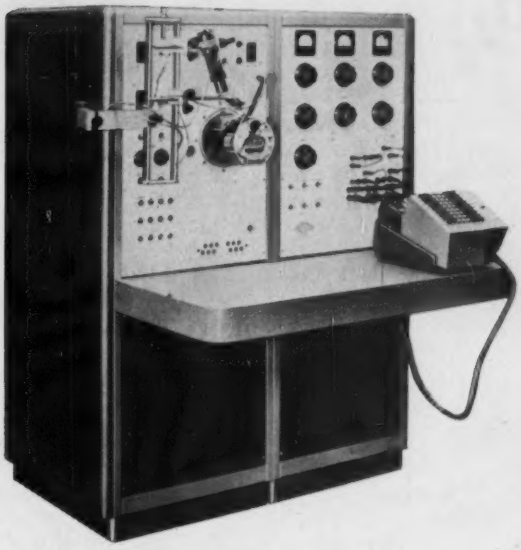
BURNDY

58-18

NORWALK, CONNECT. • BICC–BURNDY Ltd., Lancs., England • In Continental Europe: Antwerp, Belgium • TORONTO, CANADA

CIRCLE 66 ON READER SERVICE CARD

To obtain more information on these items, use code numbers indicated for the items when filling in Reader Service Card



Meter Calibrator . . .

. . . tests all types of single phase and poiy-phase watthour meters with a maximum of three complete stators per meter. A series test and as many as three current-element checks are programmed for automatic testing and recording of results on a tape. The electronic one-revolution calibrator accommodates meters with a variety of voltage, current and Kh ratings.

Eastern Specialty Co, 3617 N 8th St, Philadelphia 40, Pa. (1)

Power Rodder . . .

. . . for cleaning and threading conduit is furnished in the model shown or truck mounted. Used with $\frac{5}{16}$ and $\frac{3}{8}$-in. rods, the unit has positive rod drive and 20,000 lb pull for pulling back. It features also one-man controls, a footage meter and 1,200-ft capacity.

O'Brien Mfg Co, 5632 Northwest Highway, Chicago 46, Ill. (2)

Digital Computer . . .

. . . is for day-to-day data processing and accounting work. The E103, a small computer, comes with an accounting machine printer and a control unit that provides programming flexibility. A series of programs has already been developed. The magnetic drum memory stores 220 words.

Equipment & Systems Div, Burroughs Corp, Detroit 32, Mich. (3)

Derrick . . .

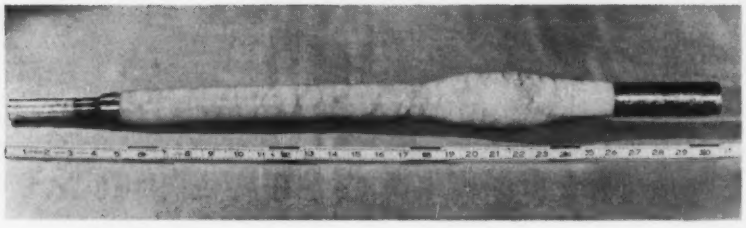
. . . is a size addition to a line of series PM-30 Pole-Master oscillating hydraulic derricks. It handles 40, 55 and 70-ft poles. It has unrestricted vertical movement, which permits positioning of the head sheave at any point in an arc extending from stowed position to the ground. It can also be spotted anywhere in a horizontal arc from one side of the truck body to the other. The derrick, rated at 8,000 lb, can also be used to support an hydraulic digger.

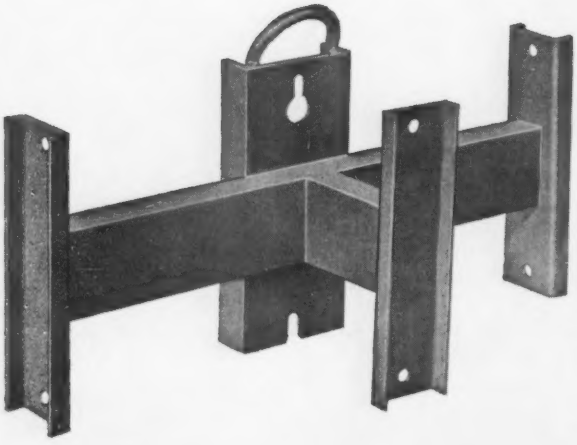
McCabe-Powers Body Co, 5900 N Broadway, St. Louis 15, Mo. (4)

Cable Accessory Kit . . .

. . . for making hermetic oil-seals in pothead terminations for paper-lead cable is available for the 23-35-kv range. The seal is made with a laminate of epoxy resin and orlon tape, which go over the stress cone and extend from the lead sheath to the terminal ferrule. The kit is No. 735.

Epoxylite Corp, 1428 N Tyler Ave, South El Monte, Calif. (5)





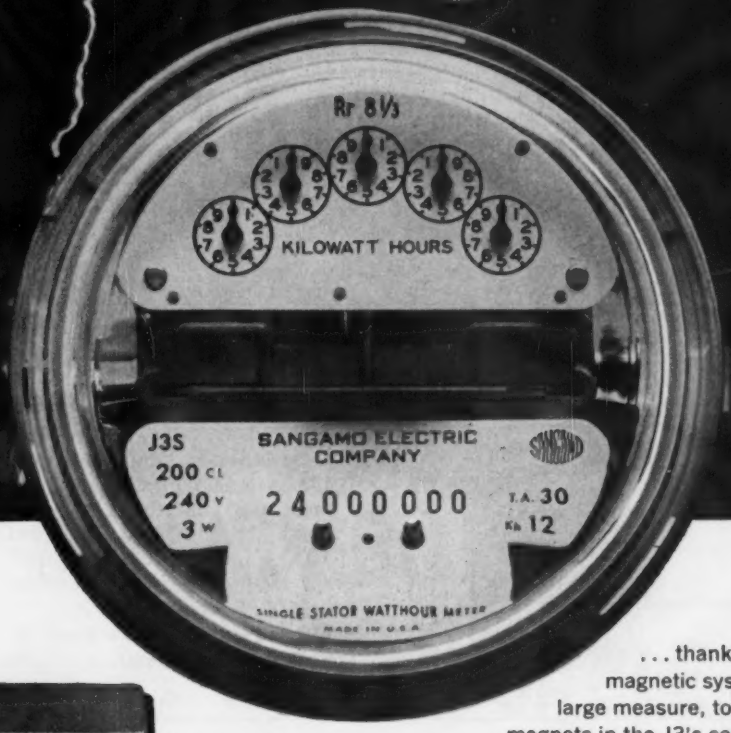
Mounting Rack . . .

. . . for oil circuit reclosers permits the reclosers to be mounted on the rack before it is hoisted into position. An arrester bracket can be mounted on each channel for protection of the adjacent recloser. For servicing, the rack with reclosers can be replaced with a similar unit. Another model holds two reclosers. The rack will also support 5-25-kva transformers.

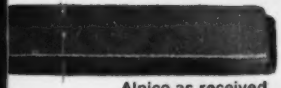
Turner Electric Co, 9510 St. Clair Ave, East St. Louis, Ill. (6)

(More New Equipment on page 70)

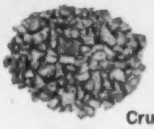
THE SANGAMO J3 SHRUGS OFF SURGES



. . . thanks to the permanence and stability of its magnetic system. Permanence and stability due, in large measure, to the high quality and uniformity of the magnets in the J3's controlled floating system.

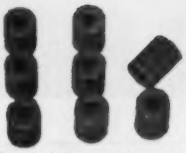


Alnico as received



Crushed

Ground



Bonded Alnico Magnets

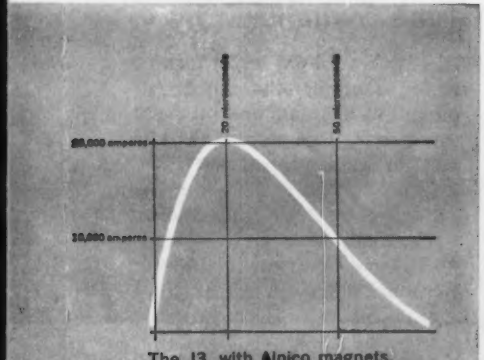
These magnets are made by Sangamo. Made of bonded Alnico. Extra-high coercive force Alnico material is crushed and ground into a fine powder, then bonded into magnets . . . dimensionally and magnetically uniform magnets that have none of the variable characteristics associated with cast and sintered magnets. Each magnet is also thoroughly factory-aged to make sure its strength will not diminish through long years of service.

Actually, all of the components of the J3 are virtually unaffected by high surge currents—even after repeated surges of 20,000 amperes through the neutral wire and 2,000 amperes through the current coils. This includes the electromagnets as well as the Alnico floating system and damping magnets. Surges and short circuits which can de-magnetize even the best chrome steel magnets can't affect the J3 Alnico magnets.

The true magnetic floating system of the J3 never requires maintenance or replacement and is guaranteed for the life of the meter. That's just one of many good reasons why the J3 is your best investment in watthour meters.

Other reasons? A visible, self-cleaning gap; substantially reduced side thrust; insignificant tilt error; advanced insulation level; smallest size; better visibility for inspection and testing; highest torque; slowest speed; lowest watts loss; sectionalized construction; corrosion-resistant finishes and materials; glaskyd base.

Your Sangamo Representative has the complete J3 story. Get it; you'll discover that the J3 has everything you want in a watthour meter. And that's a promise, for this is one of the really great ones.



The J3, with Alnico magnets, easily passes all high current tests of MSJ10.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

CIRCLE 69 ON READER SERVICE CARD

J3

JH60-9

KLEIN
-KORD
NYLON
SAFETY
STRAPS

WITH THESE FEATURES

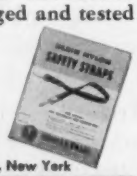
Klein developed the first fabric safety strap and have pioneered in every development. The recently introduced Klein-Kord Nylon Safety Strap offers these features:

LONGER LIFE—Superior construction, woven from filament nylon. Stretch has been almost eliminated.

PLY ADHESION—The multiple plies of strongly woven pre-dipped nylon are frictionized in neoprene and vulcanized.

FLEXIBILITY—Klein-Kord Nylon Safety Straps are extremely flexible and assure maximum comfort and greater strength. When tested in use, these straps are capable of a test load of 2750 pounds, far in excess of any load they will be called upon to support in service.

QUALITY HARDWARE—All buckles and snaps are drop-forged and tested by Klein in their own forge shop.



WRITE FOR BULLETIN 560

ASK YOUR SUPPLIER

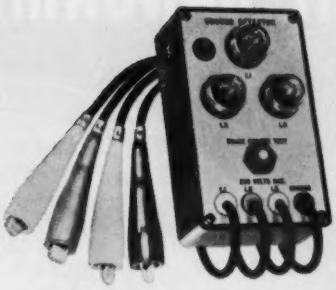
Foreign Distributor:
International Standard Electric Corp., New York

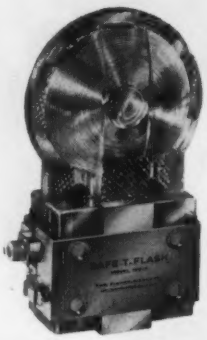
Mathias Established 1857 KLEIN & Sons Chicago, Ill., U.S.A.

7200 McCORMICK ROAD, CHICAGO 45, ILL.

Ground Detector . . .

. . . for underground systems detects any ground fault from 0 to 50,000 ohms and indicates the faulted phase. The model MP2 is for 2 and 3-phase circuits at 105 to 480 v. A test circuit permits intentional grounding of each phase through a resistor. The leads are color-coded and the clips are insulated.
Opad Electric Co, 43 Walker St. New York 13, N. Y. (7)



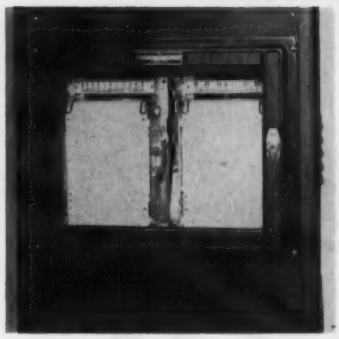


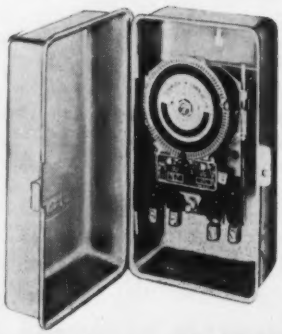
Safety Light . . .

. . . for mounting on a barricade or saw horse has a 7-in. amber-colored plastic lens. The model 1751A Safe-T-Flash flashes 135 times per min, the 1751B, 67 times. Flash durations are 55 and 110 millisec, respectively. Both are weatherproof. Power comes from a 6-v battery.
Fisher-Pierce Co, 170 Pearl St, S. Braintree 85, Mass. (8)

Twin Recorders . . .

. . . have within their case a new high-speed chart drive that provides speeds as high as 3 in. per sec. It can be shifted electrically among hour, minute and second speeds. Power to the drive is 120 v, 60 cps. The twin recorders are furnished for flush mounting in 19-in. relay racks.
Esterline-Angus Co, Box 596, Indianapolis 6, Ind. (9)





Time Switch . . .

. . . with a 14-day cycle turns a motor, pump or other equipment on and its alternate unit off every seven days. This permits the idle unit to gain proper rest. The model 14D1197 time switch is a single-pole, double-throw unit, whose dial rotates each 14 days.
Tork Time Controls, Inc, Mount Vernon, N. Y. (10)

(More New Equipment on page 74)

. . . IN A CABLE SPREADER

Fargo introduces the "S-1" cable spreader using wet process porcelain and designs familiar for years to the electric utility industry. The "S-1" with known long term dielectric and mechanical strength sets a new yardstick for dependability.

FARGO "S-1"

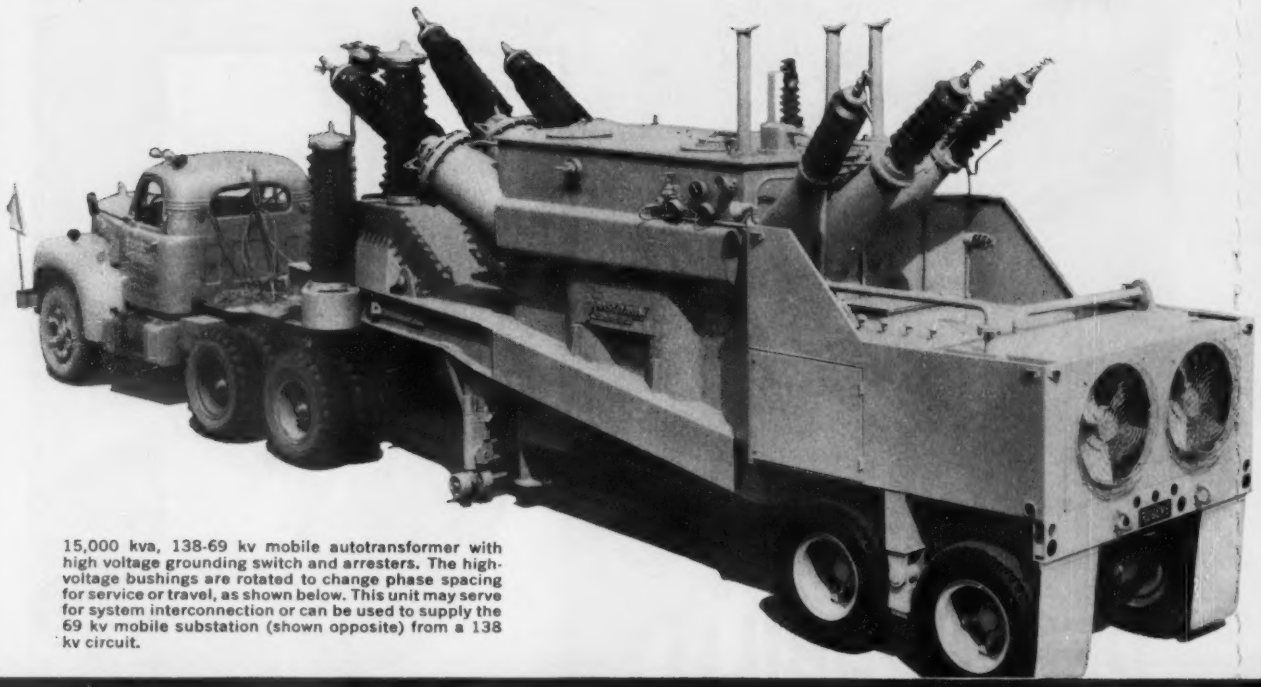
it's porcelain

1. Proved long term weather resistance.
2. Proved long term dielectric strength.
3. No bothersome grommets.
4. Easy, fast installation.
5. Positive mechanical gripping of neutral assures spacing in span.
6. Swivel action of neutral clamp ideal for grade or corner construction.
7. Inherent weight dampens cable vibration.
8. Supports weights over 1500 lbs.
9. "V" groove design covers all cable sizes from ½" to 1½".
10. Mechanically capable of withstanding forces generated by faults in excess of 10,000 amperes.
11. Six inch on center spacing suitable for 5 or 15 KV construction.

Ask your line Material Field Engineer for complete details.

Manufactured by
LINE MATERIAL INDUSTRIES
McGraw-Edison Company
Milwaukee, Wisconsin
LM

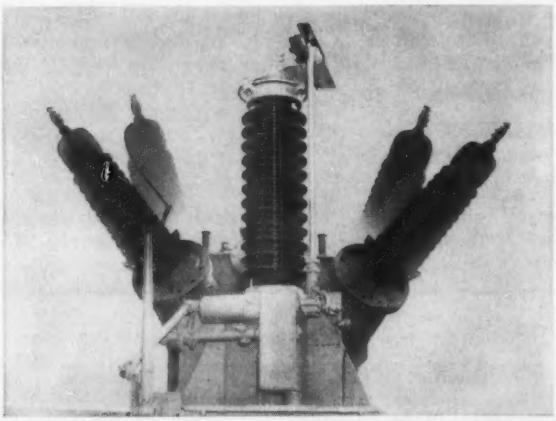
Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie
New York
FARGO



15,000 kva, 138-69 kv mobile autotransformer with high voltage grounding switch and arresters. The high-voltage bushings are rotated to change phase spacing for service or travel, as shown below. This unit may serve for system interconnection or can be used to supply the 69 kv mobile substation (shown opposite) from a 138 kv circuit.

VALUABLE UTILITY OPERATING TOOLS:

1 + 1 =



Outer high-voltage bushings of the above mobile unit, set at angles in their mounting collars, are rotated (patent pending) at the special supporting flange to reduce phase spacing and meet highway width limits while the unit is in transit, or increase phase spacing for clearance in service. Photograph shows, by actual double exposure, bushings in service and travel positions.

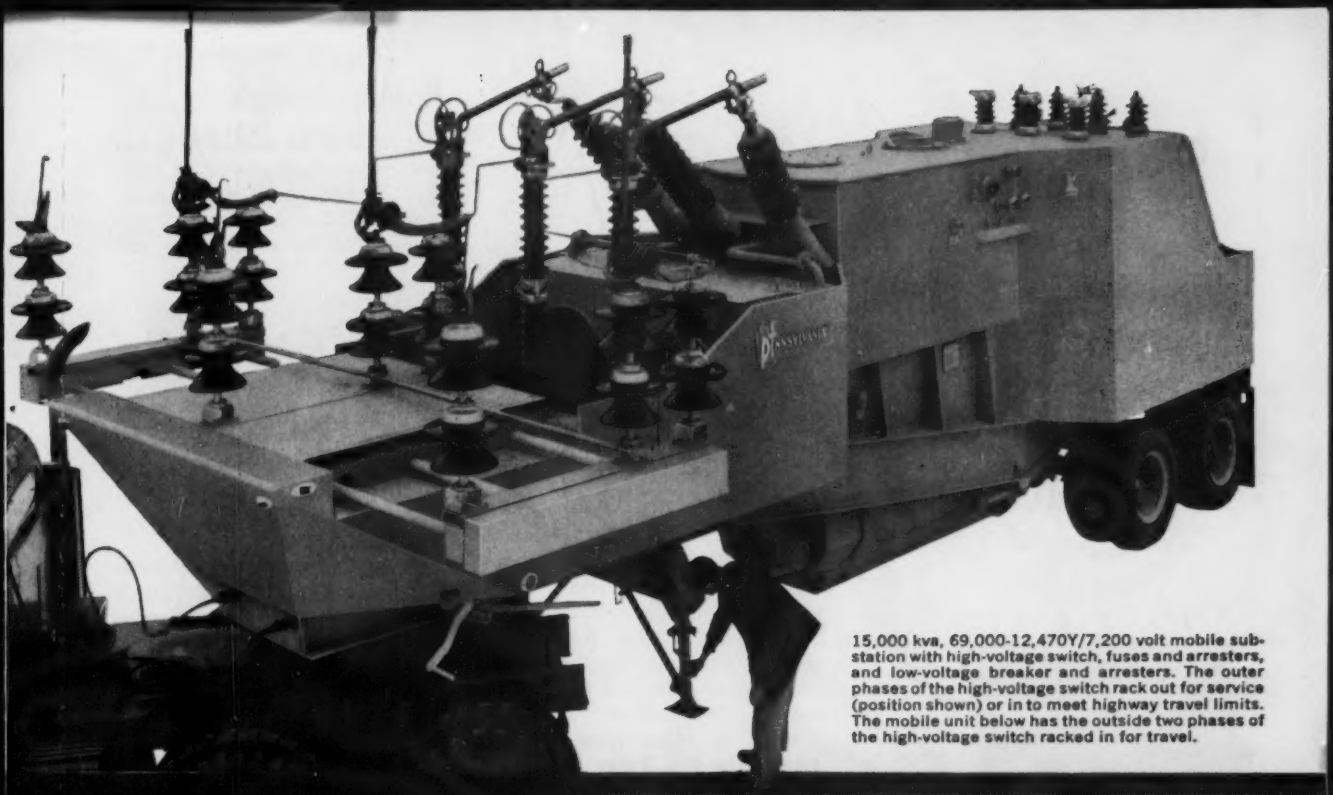
Two of the larger transformer units on wheels anywhere, meeting all restrictions imposed on their normal movement over the highways, speed capacity where needed in the system of a southwestern utility.

These streamlined Pennsylvania Transmobile units, each with a 3-phase capacity of 15,000 kva, have voltage ratings permitting their useful operation separately or connected in series combination, to satisfy a variety of system voltage requirements. One, a mobile autotransformer, converts power from 138 kv to 69 kv for system interconnection, or for supplying the second mobile unit. The other, a complete substation, converts power from 69 kv to 12,470Y/7,200 volts for supply of distribution load.

Innovations permit larger mobile units

A new basic design* of the Pennsylvania Transmobile integrates the trailer and transformer, reduces pounds per kva and puts more capacity on the road within highway limitations. Both dimensions and weights have been greatly reduced by placing the transformer tank between the trailer beams where it serves as part of the frame. Not only does the

PENNSYLVANIA TRANSMOBILE



15,000 kva, 69,000-12,470Y/7,200 volt mobile substation with high-voltage switch, fuses and arresters, and low-voltage breaker and arresters. The outer phases of the high-voltage switch rack out for service (position shown) or in to meet highway travel limits. The mobile unit below has the outside two phases of the high-voltage switch racked in for travel.

3

design make these and larger units possible, but inherent low center of gravity improves stability and handling in transit.

Mobile units essential today for system operation

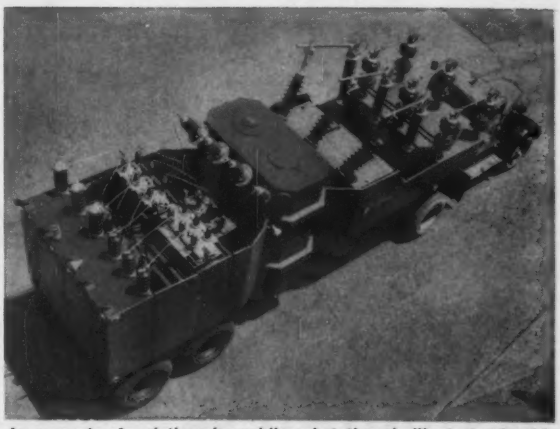
Mobile units—substations and transformers—have become indispensable to utility operators. They help maintain the high quality of service continuity required for best customer relations. They eliminate outages for maintenance and construction work, and they stand by for service in emergencies.

In addition, planned maintenance and construction work can be conducted in greater safety and at less expense. Investment in idle installed capacity can be reduced by putting spare transformers to work and loading others to capacity. New loads can be carried temporarily.

These are only a few of the ways you can profit from the use of Pennsylvania Transmobile Transformers and Substations. Large or small, they are custom-built to your specifications to meet your operating requirements. For a full story on mobile units, contact Power Sales Dept., Pennsylvania Transformer Division, McGraw-Edison Company, Box 330, Canonsburg, Pa.

McGRAW EDISON

*Patent pending



An example of variations in mobile substations is illustrated by this 5000 kva unit with 69 kv primary and 12,470Y/7,200 x 24,940Y/14,400 volt secondary. Primary is provided with a switch, fuses and arresters. The secondary is equipped with two sets of oil recloser equipment. One is connected in the circuit, depending on the transformer voltage in use (series or parallel winding connection, changed externally).

SUBSTATIONS AND TRANSFORMERS

CIRCLE 73 ON READER SERVICE CARD

SPRAGUE®

MODEL 500 INTERFERENCE LOCATOR

LOCATE rf NOISE SOURCES QUICKLY

This versatile instrument is a highly sensitive interference locator—*with the widest frequency range of any standard available unit!* Model 500 tunes across the entire standard and FM broadcast, shortwave, and VHF-TV spectrums from 550 kc. to 220 mc. in 6 bands.

It's a compact, portable, rugged, versatile instrument—engineered and designed for most efficient operation *in practical field use.* It features a transistorized power supply, meter indications proportional to carrier strength as well as sensitivity of 5 microvolts minimum for 5% meter deflection over entire tuning range.

For full details, send for brochure IL-106.

SPRAGUE ELECTRIC COMPANY
315 Marshall Street, North Adams, Mass.

SPRAGUE®
THE MARK OF RELIABILITY

Barricade . . .

. . . retracts to less than 12 in. when not in use. The steel unit, which has legs of steel tubing, is finished in black and yellow with glass beads on the yellow crossbars to reflect light. Barricades are furnished for lengths when extended of 4, 6 and 8 ft. Two red flags are furnished.

Albert W. Pendergast Safety Equipment Co, Tulip & Longshore St, Philadelphia 35, Pa. (11)

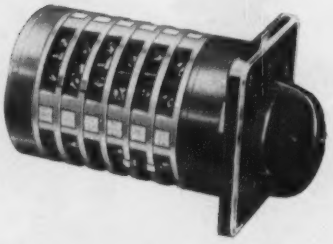
Relay . . .

. . . verifies the condition of synchronism between two system voltages. The type CVE synchro-verifier relay is adjustable to provide a contact-closing zone between plus and minus 20 and 60-deg phase angle difference between the two sources. It eliminates the need for the type CV relay previously used with the CI synchro-verifier.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa. (12)

Rotary Switch . . .

. . . rated at 20 amp, 600 v, has four isolated double-break contacts in each stage and a minimum of 12 stages. Contact operation can be arranged to suit



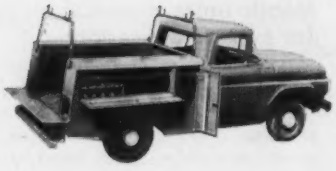
the individual circuit application. The type A-16 switch is resistant to salt spray, fungus and humidity.

American Solenoid Co, Inc, US Highway 22, Union, N. J. (13)

Fuel Oil Additive . . .

. . . is a combustion catalyst and sludge dispersant that prevents clogging of oil system components. Dearsol 30 also improves combustion. Dearsol 35, another catalyst, is useful where sludge problems are not significant. Both are soluble in residual fuel oils. Normal dosage is 1 qt per 1,000 gal of fuel oil.

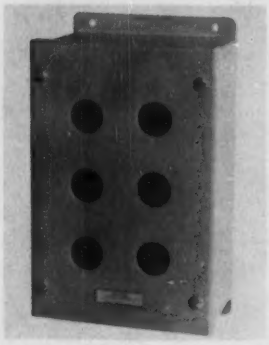
Dearborn Chemical Co, Merchandise Mart Plaza, Chicago 54, Ill. (14)



Utility Body . . .

. . . has reinforced doors with key locks and safety catches, nylon non-binding door bushings and a cargo-area floor of corrugated steel. Shelves and bins of the series 25E body can be arranged in production to suit the

buyer. A 75-in. length is offered for ½-ton chassis and 90-in. for ¾-ton chassis.
McCabe-Powers Body Co, 5900 N. Broadway, St. Louis 15, Mo. (15)



Pushbutton Station . . .

. . . for vertical or horizontal mounting accommodates standard-size pushbuttons, pilot lights and selector switches. Available sizes hold 1 to 56 units. The hinged cover of the oiltight enclosure, which is made of 14-gauge steel, is easily removed from its box.
Gemco Electric Co, 25685 W Eight Mile Rd, Detroit 40, Mich. (16)

Safety Hat . . .

. . . of plastic exceeds EEI specifications. It withstands 40 ft-lb without visible structural or material weakness. Tested penetration depth is ¼ in. Standard color of the corrision-resistant hat is yellow.
Boyer-Campbell Co, 801 W Baltimore St, Detroit 2, Mich. (17)

(More New Equipment on page 78)

The VALUABLE and VERSATILE Tool for Every UTILITY CREW
Gives One Man The Strength of Fifteen
THE AMERICAN
POWER-PULL
HOIST-PULLER
One Man Can Lift Up To 3000 Lbs.—Easily Quickly—Safely!
STRETCHES
LOWERS
LIFTS
PULLS
Utility Men Tell Us They Use POWER-PULL To...
• Set and guy poles
• Raise and lower materials
• Install transformers
• Install strain carriers
• String wire and cable
• Release or apply tension
• Stretch fence
• Handle reels
• Pull vehicles
¾ • 1 • 1½ Ton Models Tested To 1⅛ • 1½ • 2¼ Tons Weigh only 6½ to 7½ lbs.
Notch-At-A-Time Control Quality Construction — Aircraft cable, plated steel frame, stressed parts manganese bronze.
Cadmium Plated
1½ Ton Model Shown
Write for Special Utility Literature and Dealer In Your Area
The AMERICAN GAGE & MFG. Company
132 Bayard Street • Dayton 1 • Ohio
DEALERSHIPS AVAILABLE • WRITE TODAY

CIRCLE 75 ON READER SERVICE CARD

Engineered to give your transmission lines

HERE'S WHY

ALUMOWELD OVERHEAD GROUND WIRE

IS THE MOST EFFECTIVE SHIELDING

FOR YOUR TRANSMISSION LINES

thick aluminum covering

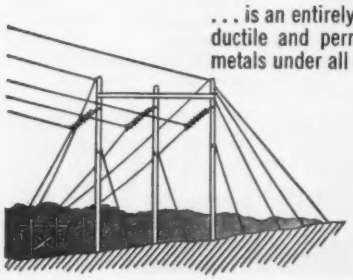
. . . provides 3 times the conductance of steel wire and the same corrosion resistance as solid aluminum wire. Alumoweld's heavy cladding of aluminum—25% by area—will not crack, flake or peel.

strong steel core

. . . gives Alumoweld the same rugged strength as extra-high-tensile steel wire, yet Alumoweld is 18% lighter in weight.

controlled atomic weld

. . . is an entirely new process which results in a ductile and permanent weld between the two metals under all operating conditions.



ALUMOWELD FOR GUY STRAND

Because Alumoweld is strong, easy to handle and will not rust, it is ideal for guying purposes.

Alumoweld is available for immediate delivery from our warehouses located in New York, Chicago, Pittsburgh and Memphis. Let us quote on your requirements for this low-cost strand.

BETTER PROTECTION–LONGER LIFE–at LOW COST...

NEW

ALUMOWELD

overhead ground wire

Alumoweld Overhead Ground Wire is in a class by itself! In addition to its superior mechanical and electrical properties, this new aluminum-covered steel wire offers the money-saving benefits of low original cost and lowest maintenance cost.

Having the rugged strength of extra-high-tensile steel wire, Alumoweld is 18% lighter in weight . . . has three times the conductance . . . and will last far longer. When compared to solid aluminum wire, Alumoweld has equal life, one third the conductivity, and eight times the strength.

Here's why Alumoweld pays off when used for overhead ground wire. Its high strength-to-weight ratio permits stringing with small sags for greater mid-span clearance. The excellent conductivity of Alumoweld assures proper operation of protective relays and effectively discharges lightning currents to ground. This greatly improves the stability and dependability of the system. Equally important is the long, trouble-free life that Alumoweld provides because of its ability to resist corrosion.

Engineering bulletin E.D. 3000 will bring you the complete story. Write for your copy today.

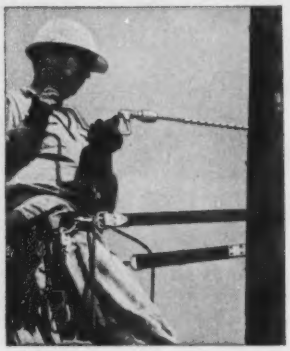
ALUMOWELD

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION
Glassport, Pa.

For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

New Irwin Pole-Bor Bit

gives non-stop boring



No stopping to clear chips, not even in creosoted poles

Now get easier, faster, non-stop boring action in telephone and power poles with the new Irwin 415T Pole-Bor bit. Chip flow is continuous. Special Irwin cutting head, twist angle, and smooth-polished hollows eliminate clogging and binding — even when boring clean through creosoted poles. Spur on head outlines hole ahead of cutting edge. Side lip then smooths hole, making it easier to insert bolts or pins.

And Irwin's exclusive and patented Adapter Shank chucks perfectly in both hand braces and electric drills to cut inventory costs by 50%, speed work on the job. All Irwin Pole-Bor bits are made of special high analysis steel, heat treated full length and machine sharpened for extra accuracy, longer life. Save time, save money. Order from your Irwin distributor.

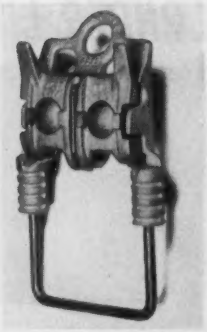
Overall Length: Approximately 18″, with 12″ twist, 6″ shank
12 Sizes: 9/16″ to 17/16″

Irwin Adapter Shank fits both hand braces and electric drills

Comes like this with taper square shank for use in hand braces.

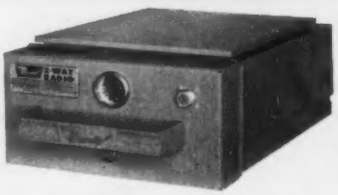
Cut off taper square shank. Use in both hand braces and electric drills. No wobble, no run-out.

IRWIN Wilmington, Ohio
every bit as good as the name



Stirrup Clamps . . .

. . . in two sizes cover the range of wire sizes, No. 4 AWG to 397.5 MCM ACSR. Snap grip for the main wire protects against accidental removal during installation. Aluminum or copper stirrups, either straight or angled, and hex or eye nuts are furnished.
Jasper Blackburn Corp, 1525 Woodson Rd, St. Louis 14, Mo. (18)



Radio . . .

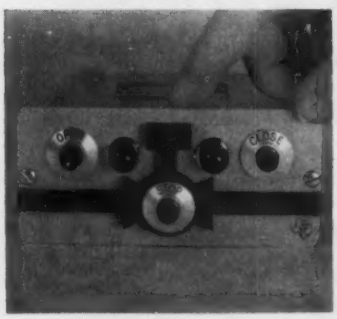
. . . for remote base station operates in the 150-174-Mc range. The model 172L65C, which is powered by 117 v ac, is transistorized to minimize down time. The transmitter output is 50 w and receiver sensitivity is 0.4μv.
Bendix Radio Div, Bendix Corp, Baltimore 4, Md. (19)

Overload Relay . . .

. . . is temperature compensated to operate on the same time curve at all temperatures from —20F to 165F. Current setting is made and sealed at the factory by means of a calibrating screw. The ambient compensated overload relay, which is for use with magnetic starters, is furnished in ratings from 25 to 300 amp continuous. Manual and automatic reset are offered.
Arrow-Hart & Hegeman Electric Co, 103 Hawthorn St, Hartford 6, Conn. (20)

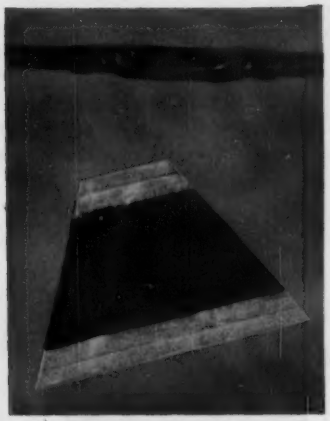
Warning Marker . . .

. . . for transmission lines is for the safety of low-flying aircraft. The hollow, bell-shaped cone marker, which is impregnated with orange in accordance with international air safety codes, is made of plastic reinforced with fiberglass. The four-pound bell is 20 in. high and 20 in. in diameter at the base.
Pacific Float Co, Box 78, Dillard, Ore. (21)



Control Unit . . .

. . . with a graphic symbol on the front is for remote indication and control of valves, motors and power-actuated devices. Two wires connect the remote indicating control unit with the actuated device.
Texas Instruments Inc, 3609 Buffalo Speedway, Houston 6, Tex. (22)



Insulating Pads . . .

. . . for compression connectors are highly resistant to moisture and won't crack or discolor because of changing weather conditions. The "Insta-Seal" pads are flexible, non-sticky, and can be applied much faster than tape. Installer simply wraps a pad around a conductor, presses the two edges together, and wraps the pad's extended "ears" around the cable entrances to the connector. The pad bonds or vulcanizes itself and contracts to form a permanent, leak-proof seal.

Anderson Electric Corp, P. O. Drawer 2151, Birmingham, Ala. (23)

Fire Extinguishers . . .

. . . in five sizes in each of two price ranges make up C02 portable extinguisher line. Sizes are 2½, 5, 10, 15 and 20-lb capacities. Simplification and streamlining of release valve design, use of precision calibrated high-

It is better not to. The best protection is to clean down to bare metal, then paint. But this isn't always possible. What then?

The following Subox system provides the next-best protection:

1. Remove all the loose rust. Loose rust cannot bond any paint.

2. Apply a coat of Subox Primer. This is made with specially-treated vehicles and minute particles of lead suboxide to penetrate through firm rust to the metal surface. The lead suboxide remains chemically active to give anchor-bolt adhesion and maximum rust inhibition.

Subox Primer is exceptionally weather durable. It alone will provide protection for a long time. It will not crack, peel, chip or blister. It combines readily with finish coating, and even when the latter has worn away will continue to safeguard the metal surface.

Each year more construction and maintenance engineers specify Subox Primer.

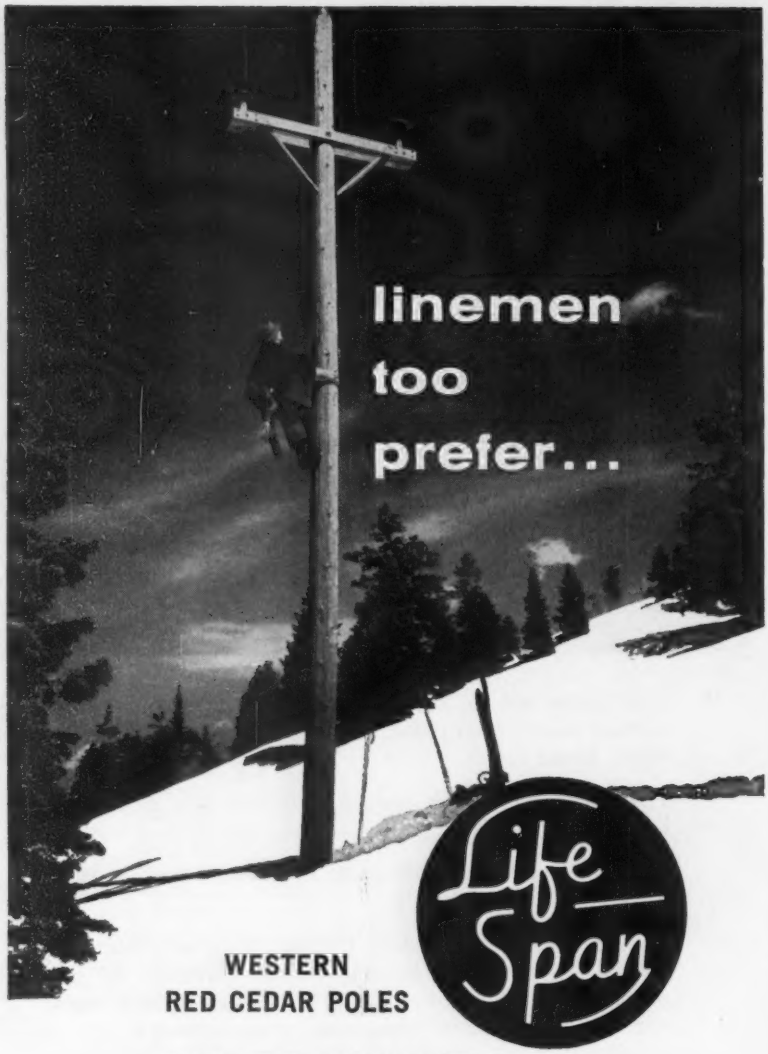
Send for literature and color card.

SUBOX PAINTS

Subox Inc.

Trade Mark

Established 1924
3 Fairmount Plant, Hackensack, N. J.
Subox Company of Canada, Weston, Ontario



WESTERN
RED CEDAR POLES

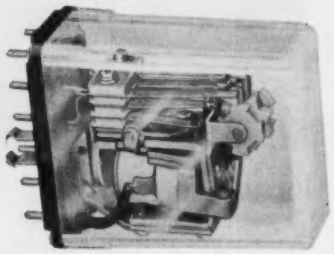
They're Safe, Clean to Climb and Deliver Many Added Years of Trouble-free Service

LIFE-SPAN Western Red Cedar Poles are clean and protected from top-to-butt. They are the result of years of continuous research and are **completely** immune to decay. To serve the utility industry better, Page & Hill maintains three mechanized yards with modern handling equipment. The LIFE-SPAN treatment applied to P&H poles complies with all approved E.E.I. or A.W.P.A. Thermal specifications.

When you buy — specify LIFE-SPAN Western Red Cedar Poles! They're your assurance of longer pole-line service at far less per annum cost.

PAGE & HILL, Inc.
MINNEAPOLIS 3, MINNESOTA

capacity discharge horns and other refinements provide increased performance efficiency and fire killing effectiveness.
Fyr-Fyter Co, 221 Crane St, Dayton 1, Ohio. **(24)**

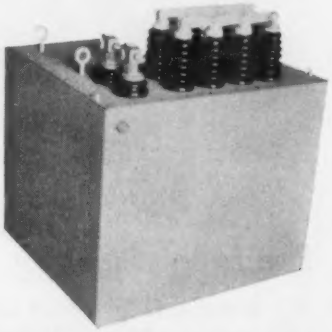


Relay . . .

. . . for industrial control is designed to control the alternating operation of such equipment as two motors or two compressors. The frame 211 industrial control relay, which is furnished for make or break operation when energized, has contacts rated at 5 amp for 115 v ac or 24 v dc and 0.5 amp for 115 v dc.
Struthers-Dunn, Inc, Pitman, N. J. **(25)**

HV Test Set . . .

. . . for dielectric strength testing produces full kva rating at ¼, ½ and full output voltage. Full rating is gained through re-

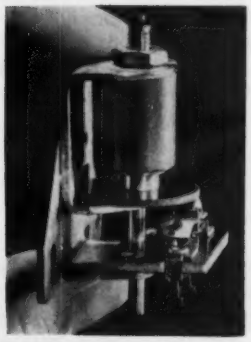


connection of the 8 high-voltage secondary bushings. Voltage is continuously adjustable by motor control. A variety of voltage and kva ratings is available. The

second unit of the ac set is not shown here.
Peschel Electronics, Inc, Patterson, N. Y. (26)

Winter Liners . . .

. . . that are metal-free for safety from electric shock are warm and easy to wash. The model FC-2 shown has a ⅜-in. deep orlon pile lining. Model FC-4 has a removable ear flap, which attaches to the cap with an all-plastic zipper. Six types of liners available fit all safety hats.
Jackson Products, Air Reduction Sales Co, 31739 Mound Rd, Warren, Mich. (27)

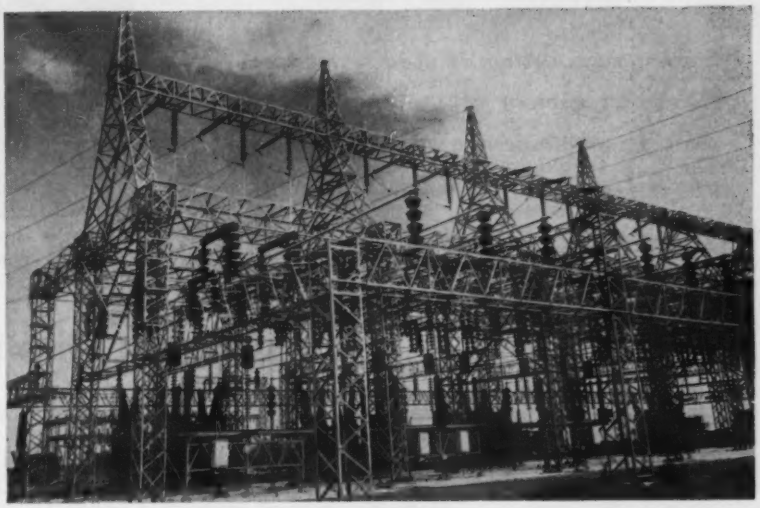


Switch . . .

. . . operates with time delay, variable from 1 sec to over 1 min. Model TDS-10, for open or enclosed mounting, is rated at 5 amp, 115 v; other ratings are available. Standard temperature limits of –40F to 300 F can be extended several hundred degrees.
Park Products Co, Inc, 4901 Perkins Ave, Cleveland 3, Ohio (28)

FLINT

DISTRIBUTION AND SWITCHING SUBSTATIONS



Always Include:

- ATTRACTIVE PRICE
- BEST QUALITY
- LOW TRANSPORTATION COSTS
- DELIVERY RELIABILITY
- COMPLETE ENGINEERING SERVICE

ALSO: Fabricated Steel Plate
Fabricated Galvanized Steel
Fabricated Reinforcing Steel
Steel Service Center

We Invite Your Inquiries

FLINT STEEL

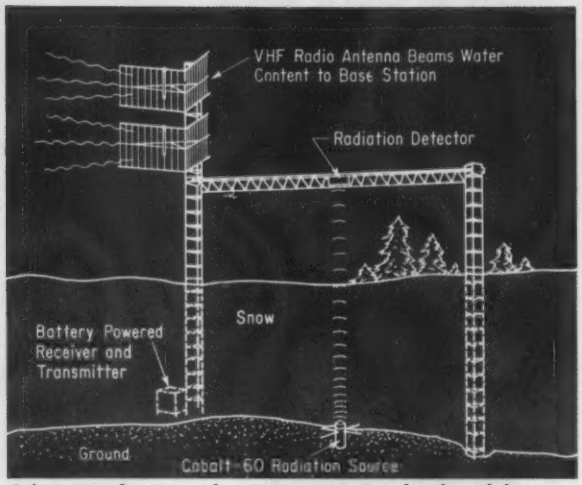
P. O. BOX 1289 · LU 4-3621 . . . TULSA 1, OKLAHOMA
MEMPHIS, TENN.

CIRCLE 81 ON READER SERVICE CARD

ELECTRIC UTILITY METHODS

FEATURE SECTION

Snow gauge system is used to measure the water content of the snowpack in remote mountainous areas. This data is used to forecast stream flow



Schematic drawing of snow gauge site developed by the Sacramento District of the US Army Corp of Engineers

Gamma Radiation Gauges Snow Pack

C. ROBINSON, Chief of the Electrical Design Section, US Army Engineer District, Walla Walla, Wash.

Mountain-located gamma ray gauges quickly and efficiently measure the water content of snow in selected snow courses. The gauges, coupled to a command telemetering system, provide the US Army Corps of Engineers with the snowpack water content data required for flood prediction and improved reservoir management. Man no longer needs to physically combat the elements to obtain snow depth measurements. Significantly, the gamma ray gauge presents the required "water content" measurement directly, rather than on a "snow depth conversion" basis.

The new method of snow gauging consists in measuring and recording radiations which pass, through the snow from a radioactive cobalt source in the ground, to a detector unit 15 ft over head. Some of the radiations are absorbed by the snow and do not arrive at the detector. Only the water content—not the depth of the snow—affects the absorption. The intensity of radiation at the detector therefore is a function of the water content. Electrical pulses from the detector are transmitted by radio from the gauge site through a chain of relay stations to the base station, where the interpreted data is permanently recorded in printed form on paper tape for present usage and future long-range predictions.

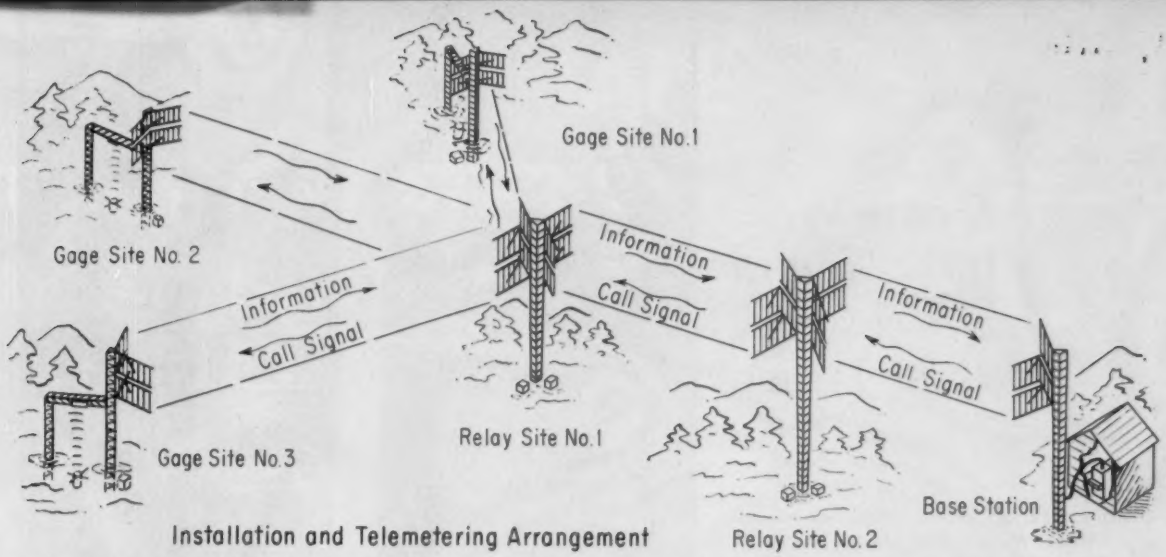
After pioneering work by the Sacramento District of the Corps of Engineers, the system was adopted by the Walla Walla District for use in the Clearwater River Watershed in Idaho. Three wind-sheltered gauge sites were chosen at locations which would give readings of the average snow pack at elevations from 5,300 to 8,300 ft. Each site is in direct line of sight from the first relay station.

The radioactive source at each gauge site is a lead shielded collimator containing 80 millicuries of cobalt 60. This quantity was chosen so that radiation penetrating 50 in. of water equivalent—the maximum depth the system is designed for—is higher than the background count by an amount sufficient to make readings possible. Since cobalt 60 has a half life of approximately 5 years, several brass shims are provided for mounting over the collimator for reduction of radiation and to allow recalibration at the beginning of each snow-measuring season. A lead-filled cap is screwed on during summer months and locked in place.

A scintillation detector is mounted on an H-frame structure 15 ft above the collimator at each gauge site. The detector, which receives the radiations, consists of a 1½-in. dia thallium-activated sodium iodide scintillation crystal and a photo-multiplier tube. The gamma rays are emitted from cobalt-60 in two energy bands, 1.33 and 1.17 Mev.

The equipment in the base station consists of a receiver, transmitter, program unit, counter unit, printer, and power-and-control unit. This equipment is operated from 120-v, 60-cps power. The electrical pluses originating at the gauge sites are received and counted, and the result is printed on paper tape in a modified adding-machine printer mechanism. The printed record is the time in seconds required to reach a predetermined number of electrical pulses. This measured time, inversely proportional to the amount of radiation absorption, is the water equivalent of the snowpack. Calibration curves are straight lines on semi-logarithmic paper, except at great depths of snow for which the curve bends as the transmitted count approaches the background count.

The counter unit first samples the rate at which the pulses arrive, places and identifies it in one of



Installation and Telemetering Arrangement

Radiations emitted from radio isotope cobalt 60 are converted by the scintillator to electrical pulses for transmittal through relay station to receiving station of US Army Engineer District, Walla Walla, Washington

Water Content

three predetermined total-count channels, and prints the number of seconds required to complete the count.

The program unit is composed of three functional parts: calendar-clock section, the programming section and data-scanner section. The calendar-clock section provides date and time (month, day and hour recorded as series of six digits) and starts the automatic interrogation sequence. Upon receiving an interrogation start signal, the transmitter is energized and turns on the relay stations and the first gauge site. The returning signal from the site turns off the transmitter and sets up the counting circuits. If no pulses are received within 20 sec after the return signal starts, the program unit will continue its cycle and interrogate the next site.

If a satisfactory count is received, the transmitter is again energized, this time modulated with a turn-off tone. When the gauge site responds and its transmitter is shut off, the base station transmitter is also de-energized and the data-scanner section scans all pertinent points in the counting unit. The printing unit prints out two lines of digits: a time and date line, the number of seconds required to reach preset count, scale factor and gauge site identification line. If the pulse rate does not reach the preset minimum at the end of 200 sec, the printer indicates no count and the cycle is continued to send out the turn-off tone and interrogate the next site.

Because of differences in collimators, particularly as regards radioactive sources and shims, it is necessary to calibrate each gauge site annually.

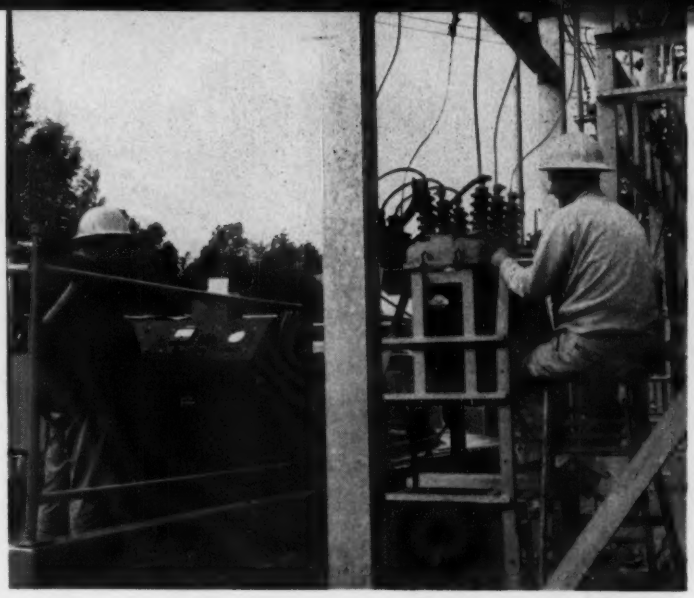
Calibration was accomplished with water contained in a tall steel drum one and one-half 55-gal drums welded together. A transparent plastic tube was connected to a fitting at the bottom of the barrel and fastened vertically to the side, so that the depth of water could be accurately measured. A series of zero readings without the drum was taken, then a series with the empty drum in place over the collimator, and finally readings at increasing increments as the drum was filled with water. At least three readings were taken at each depth, and the calibration curves plotted to the averages.

The system was found to be somewhat critical in adjustment. Also it was necessary to adjust the receiver gain at the relay sites several times—possibly because battery voltage was reduced as the units were operated. Some variation of readings with variation in temperature of the detector was found. More effective temperature compensation will be added before next season.

However, all gauge sites reported satisfactorily over an entire winter, and late season daily readings gave new data on the rate of snow-melt.

Base station picks up incoming impulses and records them automatically on computing tape for analysis

Guess Work Taken Out of Oil Circuit Recloser Testing



***ROY F. WEBLER**, Supervisor of Stations, Northern Division, Western Massachusetts Electric Co, Turners Falls, Massachusetts*

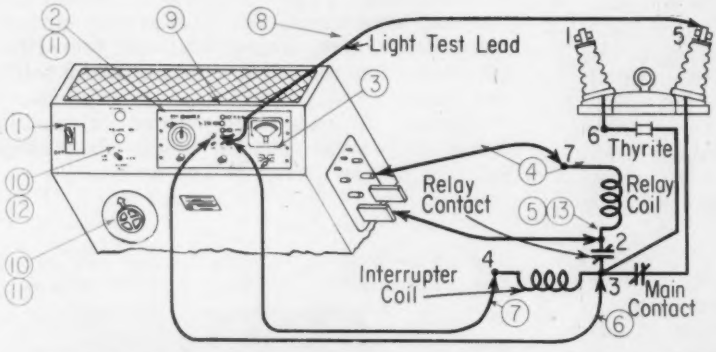
A high-current low-voltage testing device introduced at Western Massachusetts Electric Co eliminates the "approximate" approach in conditioning and checking out the electrical and operating characteristics of oil circuit reclosers. The test unit, the Universal (ACTS) Portable Test Set, manufactured by the Multi-Amp Electronic Corp, provides safe and easy-to-use facilities for acceptance and maintenance tests, both in the shop and in the field. Precise recloser operating environments are readily established to facilitate testing: minimum tripping current, operating sequence, counter operation and co-ordination.

Various methods for testing circuit reclosers had been utilized by WMECo prior to obtaining the Multi-Amp ACTS—such as, the battery method and the fault-staging method. However, these methods merely exhibited the reclosers' ability to open or close, rather than establishing the electrical characteristics of the unit —all of which are required for a complete analysis and adjustment of the reclosers.

Basic components of the recloser testor consist of an output transformer with a multi-tap secondary to provide taps at various current and voltage ratings; a variable autotransformer to supply the primary of the output transformer; a current-sensitive electronic-actuated timer to measure the intervals of current flow; an arc current time simulator (ACTS) to compensate for the time duration of the absent arc; equipment for short circuit and overload protection; and the necessary relays and contactors to energize the related circuits in the required sequence for recloser environment simulation.

The current actuator permits measuring the time of current flow without the use of auxiliary contacts. Timing is recorded by a cycle counter that picks up with the initiation of current, and

(Continued on page 103)

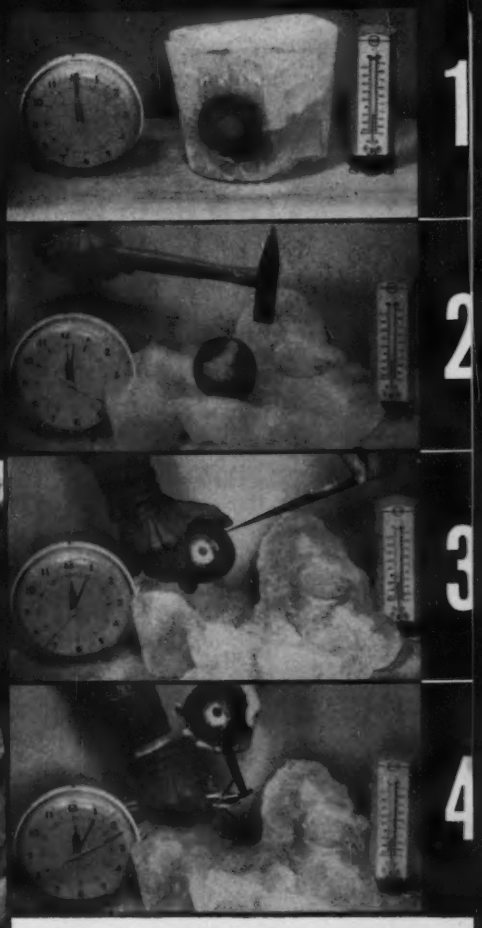


Measuring Recloser Minimum Trip Current & Total Fault Current Time

1. Throw tester "ON" with circuit breaker.
2. Reset timer.
3. Set ammeter to proper range.
4. Disconnect relay coil from Point 6 on the recloser. Connect one test cable from relay coil (Point 7) to proper tester output terminal.
5. Disconnect interrupter coil from Point 2 on the recloser, and connect Point 2 to the tester COMMON Terminal.
6. Connect decloser Point 3 to tester Terminal T_8.
7. Connect free end of recloser interrupting coil, Point 4, to tester Terminal T4. T7 or T8.
8. Connect light test lead from recloser Point 5 tester to terminal T-5.
9. Throw toggle switches to positions shown.
10. With control now at zero, throw and hold initiating switch in momentary ON position. Gradually turn knob clockwise while observing ammeter. The highest current value read before the interrupter coil operates is the minimum Trip Current. Release initiating switch.
11. Reset timer. Turn control knob to higher value.
12. Throw and hold initiating switch in momentary ON position. Recloser will go through 4 operations to lock out, or hold closed. In the latter case, release the initiating switch immediately after the 2nd operation. Timer indicates total fault current time.

SLIPKNOT CW TAPE

STRIPS AND STICKS AT 20° BELOW



THIS IS THE COLD-WEATHER VINYL TAPE YOU'VE BEEN WAITING FOR . . .

At 20°F below zero, this remarkable vinyl tape –

- **Strips easily from the roll . . .**
- **Remains completely flexible . . .**
- **Sticks down instantly — molds perfectly — holds permanently!**

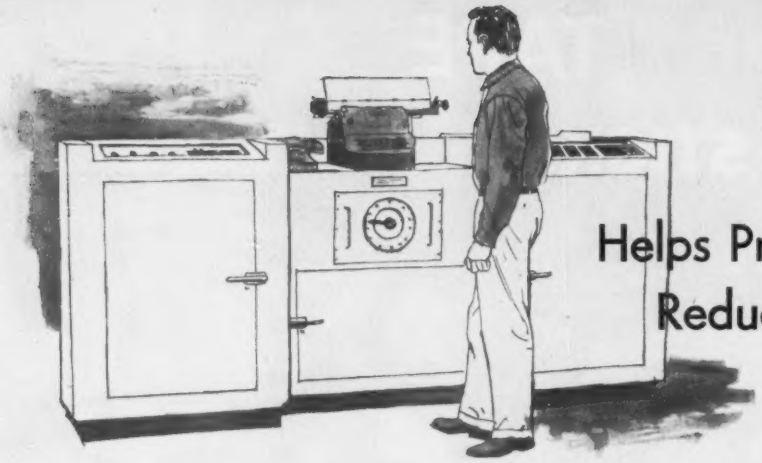
Try it in your home freezer – write for a sampl roll on your letterhead today!

CIRCLE 85 ON READER SERVICE CARD

SOLD ONLY THRU RECOGNIZED DISTRIBUTORS

PLYMOUTH RUBBER COMPANY, INC.

QUALITY SINCE 1896 CANTON, MASSACHUSETTS



Data Logger Helps Protect Turbines, Reduces Manpower

C. M. WHITE, Prof Engineer, Assistant Station Supervisor,

A. H. CSEPE, Assistant Substation Maintenance Engineer, B. C. Power Commission, Victoria, B. C.

An automatic data logger helps to assure safe and economical operation of four gas turbine units operating at 75.5 Mw at British Columbia Power Commission's Georgia Generating Station. Fifty points of temperature and other operating information are scanned by the logger continuously, in addition to providing a specific log of measured values at predetermined intervals. Savings in direct labor cost could amount to approximately two men per shift when the station is operating at full capacity.

The Georgia Station was designed and built to supply energy during low water periods, and for spare peaking capacity on the all-hydro system. Treated bunker fuel is burned in the turbines.

Selected operating data is presented in digital form on a printed log sheet by an automatic typewriter at predetermined intervals. Initially, the input switching circuits select in sequence the various primary measuring elements, such as thermocouples and resistance-temperature devices. Then, the millivolt signal from each of these sensing elements is directed to the alarm detection system where that value is compared to a set point to determine whether or not an alarm condition is to be shown. At the same time the input signal is also fed to a self-balancing potentiometer.

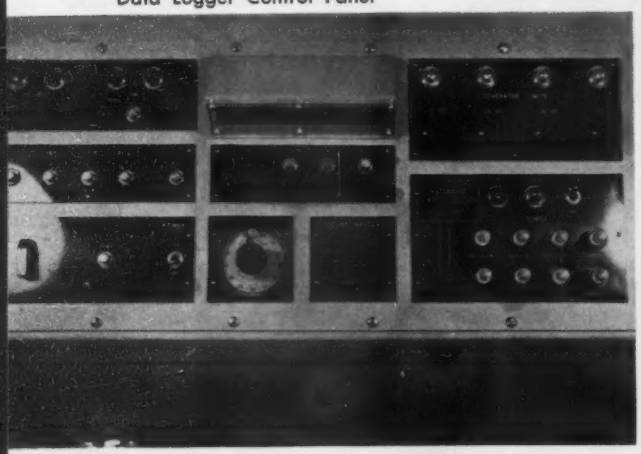
The potentiometer measures the input to position a "Digi-Coder," which converts the input value to a digital contact output signal. This information is fed to the electric typewriter which prints the measured value on the log sheet.

When the logger is not printing input switchings, the alarm detection circuit points are scanned continuously. Under normal conditions, printouts can be automatically initiated at preset intervals, or they can be manually initiated at any time. As a new alarm condition is determined, an automatic typed red printout is provided.

The turbine control operator places the data logger into opera-

(Continued on page 88)

Data Logger Control Panel



Logger Start-up Procedure

Typewriter

- Switch typewriter control switch to the "log" position.
- Switch on electric typewriter and adjust carriage to start position for readings.

Set-Point Panel

- Request a print out of all alarm set points by pressing the set point print out switch on test panel.
- Request a set of readings for one of the units, to see that the check values for the logger are within prescribed limits and that all digits are being printed in correct positions.

Control Panel

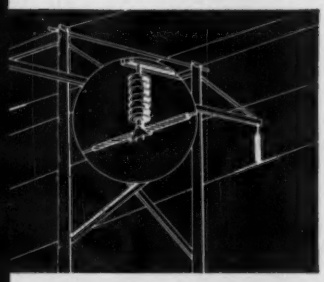
- Power switch on—amber standby light comes on during warm-up period. When logger is ready for operation, green light indicates power is on.
- Select generator unit or units for which log readings are required.
- Set time clock to co-ordinate readings with correct standard time.
- Select logging interval by setting to fixed intervals, or put logging interval switch to off and switch timer on and select any desired logging interval from continuous to 60 min.

*Superformed** means better

ACCURACY • UNIFORMITY • GRIPPING

...*for* overhead line CONSTRUCTION, PROTECTION, REPAIRS

SUPERFORMING is an exclusive patented process for helical wire forming . . . *developed* by Fanner, the earliest commercial manufacturer of machine-formed armor rods . . . *formed* by special Fanner-designed machines with unequalled accuracy, freedom from surface damage or cross-sectional distortion . . . *tested* with specially-devised equipment simulating most severe operating conditions . . . *backed* by an organization which has built on Integrity, Service and Quality . . . *SAVES MONEY* because application is fast, simple, requires no tools . . . reduces maintenance . . . extends service life of conductors. That's why *more and more utilities are using more and more Superformed Products.* A-1429A

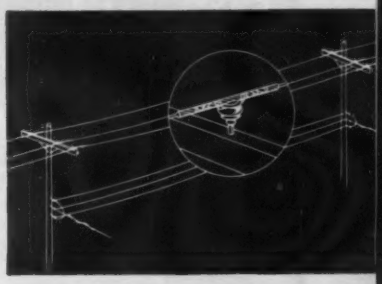


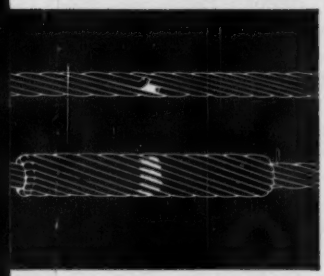
◀ ARMOR RODS

Protect against wind-induced and resonant-frequency conductor vibration at supporting points.

LINEGUARDS ▶

Protect at support points (and taps) in urban distribution where short spans are common; smaller wire sizes and shorter length than Armor Rods.



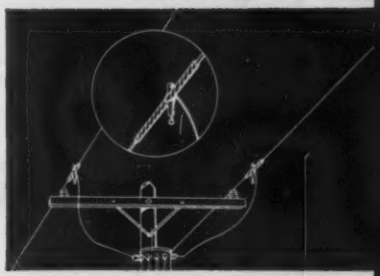


◀ PATCHRODS

Repair damaged or broken (up to 25% of strands) conductors, too far from support for Armor Rod to protect.

TAP ARMOR ▶

Protects where taps are required beyond extremities of Armor Rods on long spans or un-armored conductors.

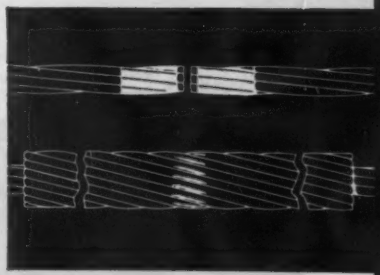


◀ FANNGRIPS

Provide ideal dead-ending and splices for wires, strands or cables for: Guys, Conductors, Multiplex Cables, Come Alongs, similar uses.

FANNSPLICES ▶

Join two ends of wire, or restore damaged conductors to original strength.



PLASTIC PRODUCTS FOR CONDUCTOR PROTECTION

Kover-Gard Ground Wire Moldings . . . Plastic Fannguards . . . Rigid and flexible Insulating Tubings.

For field or factory application, wherever there is a real need for surface covering.

STOCKS . . . SERVICE

Fanner Superforms are sold and serviced nationally by 22 Manufacturers' Agents in 34 locations. Stocked by electrical distributors from coast to coast.

PACKAGING

Superformed Products go to you in pre-packaged sets . . . the correct number of rods, centermarked with identification. Also supplied in bulk.

*Trademark

Fine Fanner Superformed Products

THE FANNER MANUFACTURING CO.
Brookside Park • Cleveland 9, Ohio
Electrical Products Division

Licensed for use under or made in accordance with one or more of the following patents: Patent No. 2,587,521, 2,769,478, 2,588,663—Other patents pending.

APPLICATION DATA

Specification and ordering are made easy by Fanner Superformed Products Catalog EP-8. Contains 48 pages of Selection, Application, Installation information.

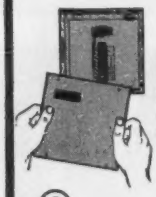
CIRCLE 87 ON READER SERVICE CARD

GTC

UNITIZED
COMMUNICATION EQUIPMENT for POWER and INDUSTRY

Effective! Reliable! Economical!

1 Highly effective in extremes of ambient noise and temperature.



2 Plug-in units provide ease of installation, expansion and maintenance.

3 Transistors and rugged, industrial type components used throughout.

4 Central control cabinet, costly engineering and fabrication eliminated.

Wherever a highly dependable, voice communication system for use in high noise level areas is needed—you'll find GAI-TRONICS specified by name.

GTC is extremely flexible in application. Write today for a copy of our completely illustrated, descriptive booklet and name of nearest representative.

GAI-TRONICS
CORPORATION
Dept. A
READING, PENNA.

GAI
FOUNDED 1926

A SUBSIDIARY OF
GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS

Data Logger Set-Point Panel

Data Logger *(Continued from page 86)*

tion by following the simple procedure outlined on page 86.

The alarm panel in upper left hand corner of the control panel is of particular interest to the operator. During normal logging operations the interval switch would be set to 10 or 20 minute intervals to permit continuous scanning of all points. If one of the alarm set points is exceeded, the alarm bell rings and a red light comes on in the "new" alarm section of the control panel. An automatic print out is thereby initiated, and as soon as the operator depresses the button to the alarm, a "continuing" alarm light comes on until the trouble is eliminated. For rapid identification, all alarm conditions print out red on the log.

The turbogenerator log sheet covers turbine, generator and bearing temperatures. The data required for the regenerative cycle units, such as regenerator discharge air temperature and exhaust gas temperature leaving the regenerator, is printed out under "Compressor In-Out" columns 1 and 2, and after "Turbine Exhause" column 6, respectively. It should be noted that the log sheet is designed to incorporate additional points that may be required.

Routine maintenance of the data logger involves testing, adjusting and cleaning of various components at approximately six-month intervals. The components requiring such work include: the self-balancing potentiometer, Digi-Coder, stepping switches, and relays. Tests are also made on the thermocouple continuity circuit, the alarm system supply circuits, and the set point system circuits. The logger has been provided with facilities which allow the routine testing to be done conveniently and quickly. Typewriter maintenance is done under a service contract.

Experience to date has been very satisfactory from an operational point of view. Since the logger was put into operation November 18, 1957, it has printed out over 18,640 lines of data with consistent accuracy. Once the problems of initial operation were solved by the manufacturer Fisher & Porter (Canada) Ltd., few difficulties have been encountered. A timer was installed May 12, 1958, and since that time the logger has operated a total of 2,209 hours.

CIRCLE 42 ON READER SERVICE CARD

Your Hole-Boring Equipment Lets You Install Chance Screw Anchors Almost Anywhere in 5 to 8 Man-Minutes

Your present boring equipment, regardless of type, can be adapted to power anchor installation simply by using a special Chance wrench that transmits torque from the digger directly to the hub of the anchor helix. Then, your crews are set to install anchors in 5 to 8 man-minutes . . . *from the time the equipment is moved into position until the anchor is ready for the guy.* (By adding a screw anchor adapter, the installation wrench can be attached without removing the auger bit.)

Chance Power Installed Screw Anchors go down fast, uniformly . . . anywhere that you can bore a pole hole with your power hole-digging equipment. Slow, tedious labor is eliminated. So, too, is error caused by human variables. Line construction is speeded, and you realize more on your investment in hole-boring equipment. Since the anchor rod itself is not subjected to torque, it only has to be heavy enough to support the guy load. That's a cost-saving factor, too.

Chance Screw Anchors range in size from 78 to 176 square inches in area. Their sharp cutting helixes of high-strength structural steel are tapered to minimize earth disturbance. Hundreds of installation and pull tests prove that Chance Power Installed Screw Anchors hold with less creep than any other anchors of comparable size. So, isn't it time for you to consider the advantages of mechanization of screw anchor installations?

Use Chance Power Installed Screw Anchors and get:

- Lower installation costs per anchor
- Better utilization of expensive equipment
- Greater holding power with less creep
- Consistent results
- Elimination of human variables
- Less physical effort, better employee relations

Contact your Chance Representative. He'll show you how you can apply this new anchoring technique to save time, cut costs, and improve your anchoring.

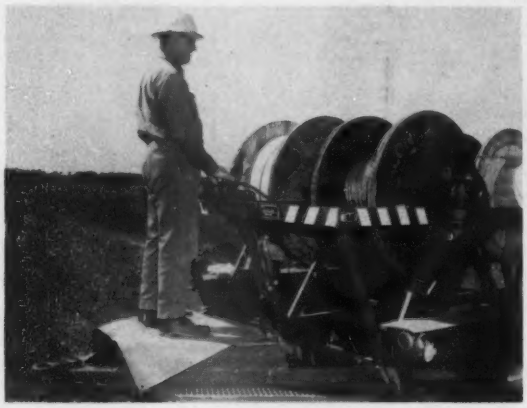
A. B. CHANCE COMPANY

CENTRALIA, MISSOURI (A. B. Chance Company of Canada, Ltd., Toronto)

CA60-31

CIRCLE 89 ON READER SERVICE CARD

Power Reeler Makes Wire Stringing Easier



The job of stringing more wire was made easier for the Green Bay line crews of Wisconsin Public Service Corp when a new trailer-mounted power operated reel was put into service. Five linemen can now string as much wire per day as eight men had previously accomplished in half a day.

The new equipment, designed by the Public Service group and custom built by the Pierce Auto Body Works, consists of two reel trailers only one of which is power operated. Wire is strung from one of the trailers and pulled in by a gasoline engine with a hydraulic pump on the other.

With the new equipment, rope from the power-operated reel is first threaded through sheave blocks suspended from the power poles. The rope is then attached to the wire conductor and the wire pulled into position by the power reel. When one reel of wire is about run out, another is spliced in.

In a recent highway relocation job, 6,222 ft of No. 4 aluminum wire was strung by five men in about 43 min, exclusive of splicing time. Formerly it would have taken a regular crew of eight men, about a half day to string the same amount of wire.

CIRCLE 90 ON READER SERVICE CARD

Prefab Cattle Pass Makes Custom Manhole

YALE GOLDBERG, *Supervising Engineer, Underground Lines, Iowa Power & Light Co, Des Moines, Iowa*

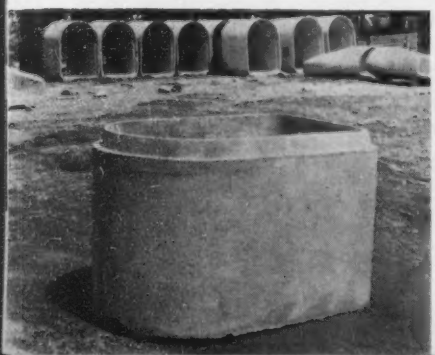
Pre-cast concrete cattle-pass sections were recently used at Iowa Power & Light Co to make an economical, easily installed customed manhole for housing a 15-kv sectionalizing switch. An approximate 20% labor saving was achieved.

Normally, when these prefab concrete sections are used as cattle-pass installations they are installed with the curved top up and the flat base down. In this way, by placing sections end-to-end, a passageway underneath a highway is installed to permit cattle to cross beneath traffic.

For manhole use, two of the 4-ft long sections were used. First, an excavation was dug and a concrete pad was poured for use as a floor—a 4-in. tile sump was installed in the floor. Then, the two prefab sections were installed end-to-end, one atop the other.

To complete the manhole a top was designed with a removable hatchway for equipment entry, and a hinged cover for personnel entry. A ladder was hung from the wall of the concrete sections to simplify entrance to the manhole.

(More Construction on page 92)



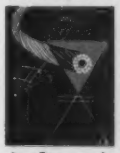
for the latest data on ACSR

126 fact-filled pages...from Alcoa

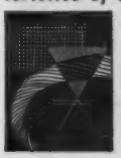
It took more than 60 years to prepare these three publications.

Recently completed tests have made it possible to review and revise data accumulated since 1897, the year Alcoa launched a continuous research program on overhead aluminum conductors— *both all-aluminum and ACSR*. The most up-to-date information has been put into book form to help you in your job:

Design or operation of transmission lines is your problem. Maybe you're called on to predict the resistance and reactance of a proposed transmission line. Are available data good enough? This 90-page book supplies you with new information on resistance and reactance—information that can help you accurately evaluate the effects of the steel core on electrical characteristics. TITLE: *Resistance and reactance of aluminum conductors.*



How much heat loss can you expect from convection? Tough problem. One that's complicated by the chimney effect of a heated conductor. And varying wind conditions. This 20-page publication provides up-to-date information on heat dissipation caused by convection and radiation. TITLE: *Current-temperature characteristics of aluminum conductors.*



Electrical requirements on your system go up. You need to operate conductors at higher temperatures than in the past. You ask yourself: what about creep effect? Here's a 16-page booklet that provides easy-to-use answers to many questions on how aluminum conductors behave when subjected to various conditions of heating by high overload currents. TITLE: *Overload and fault current limitations of bare aluminum conductors.*

Ask any one of our representatives for your copy of these new publications. Written requests on company stationery should be mailed to Rome Cable Division of Alcoa, Dept. 1-100, Rome, New York.

ROME CABLE
DIVISION OF **ALCOA**

Koenig ALL-STEEL UTILITY BODIES

LINE-CONSTRUCTION BODY

. . . available in 9' to 14'6" lengths with mechanical or hydraulic winch and derrick, or any other special or custom equipment desired. Compartments can be arranged to your specifications.

SERVICE BODIES

. . . for ½-, ¾-, and 1-ton chassis. Electrically welded into one unit with six waterproof compartments, recessed paddle handles keyed alike and fender skirt protected with die-formed rolled edges. Built for safe, dependable service . . . will outlast several chassis.

3-WAY DUMP BODIES

DUMP to the RIGHT, LEFT and REAR

All-steel welded bodies available in 8' to 11' lengths. The multistage telescopic hoist has a lifting capacity of 25,000 lbs. This is the ideal body for safe dumping under hazardous conditions . . . especially adaptable for windrowing and backfilling.

YOU CAN BE SURE OF QUALITY MATERIALS AND WORKMANSHIP WHEN YOU SPECIFY KOENIG PRODUCTS

Write today for literature, specific information and name of nearest distributor.

Koenig IRON WORKS, Inc.

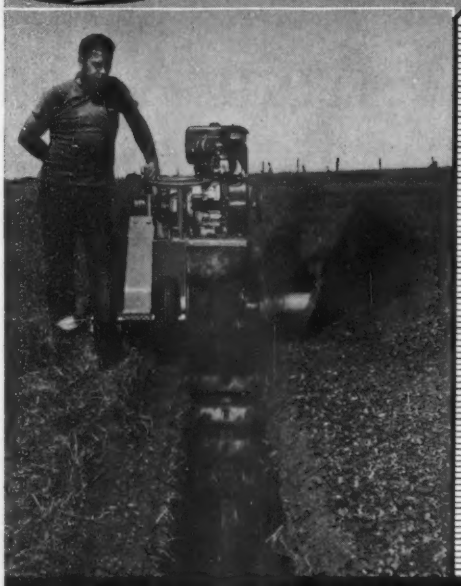
P. O. BOX 7726C
HOUSTON, TEXAS

CIRCLE 42 ON READER SERVICE CARD

DITCH WITCH TRENCHER

The measure of Success

CALL COLLECT



SCALE

COMPARE

SIZE: DIGS FROM 4" TO 16" WIDE AND UP TO 6' DEEP

COSTS: AS LITTLE AS 2c PER FOOT!

ABILITY: JOB PROVEN!

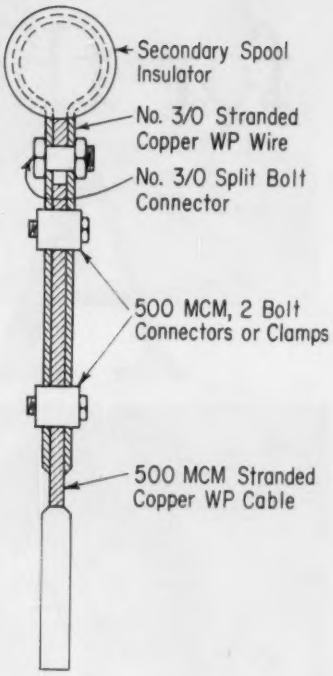
LIFE: AS HIGH AS ½ MILLION FEET!

EASE OF OPERATION: See a demonstration!

CALL COLLECT!

CHARLES MACHINE WORKS, INC.

637 BIRCH ST. • CALL COLLECT, FE 6-4404 • PERRY, OKLA


Secondary Spool Insulator
No. 3/0 Stranded Copper WP Wire
No. 3/0 Split Bolt Connector
500 MCM, 2 Bolt Connectors or Clamps
500 MCM Stranded Copper WP Cable

Heavy Cable Dead-Ended With Ease

M. L. MONSON, Superintendent, Municipal Utilities, Fosston, Minn.

The difficulties involved in dead-ending stranded, weatherproof cable larger than 250 MCM on a secondary service were recently greatly eased by bolt-splicing the heavy cable to a more flexible second cable. Labor time was sharply reduced and the achieved installation satisfies all considerations.

The stiff, heavy nature of cable in excess of 250 MCM permits a good bolted splice to be achieved with No. 3/0 stranded copper wire. First, a piece of No. 3/0 wire is formed in a U-shape around a secondary spool insulator, and bared on both tails, from just beyond the insulator to the tail ends. Next, the large stranded copper cable is bared for about one foot from its end. The large cable can then be efficiently and quickly fastened to the No. 3/0 cable with large bolt connectors. A smaller split bolt connector maintains the No. 3 cable fully wrapped around the insulator.

Tripod-Jig Holds Light Standard Plumb

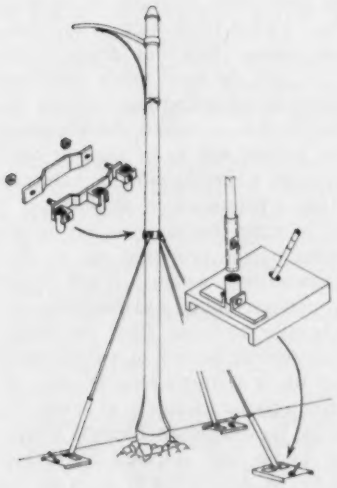
JOHN O. BAKER, *Line Foreman, Kansas Gas & Electric Co, Wichita, Kansas*

Concrete street light standards go up faster and straighter for Kansas Gas & Electric Co when installed with a tripod-type alignment jig.

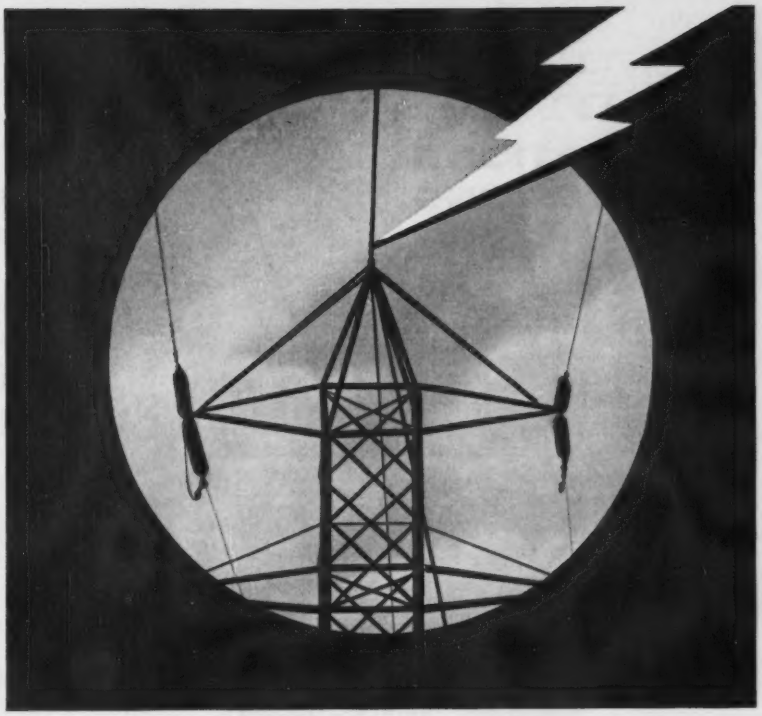
The three legs of the jig are positioned on the street parking side of the standard—the upper ends of the jig-legs are bolted to a metal band, secured to the standard above its midpoint.

The hinged feature of the legs allow the standard to be set straight. While the 8-in. channel bases usually provide sufficient footing to hold the standard erect, an anchor bar is usually driven through the base for increased safety.

Once the standard is plumbed, the jig, with all three bases anchored in place, will hold the pole in place while the hole is filled with concrete or crushed limestone and water.



(More Construction on p. 98



You're on the Safe Side with

CF&I Galvanized Steel Strand

Galvanized Steel Strand is a proven material for grounding power transmission lines. The wire used in CF&I Steel Strand is subjected to rigid quality controls for overhead ground wire and is carefully galvanized, assuring long-lasting protection against corrosive elements.

CF&I Galvanized Strand is made in accordance with ASTM Specification A-363, in seven- or three-wire constructions. For guy, messenger and other applications, CF&I strand is made to ASTM Specification A-122. CF&I is also equipped to manufacture strand to our customers' own specifications.

For quick delivery, see your local electrical distributor or contact the nearest CF&I office.

7515

CF&I STEEL

GALVANIZED STEEL STRAND
THE COLORADO FUEL AND IRON CORPORATION

In the West: THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings Boise • Butte • Denver • El Paso • Farmington (N. M.) • Ft. Worth • Houston • Kansas City Lincoln • Los Angeles • Oakland • Oklahoma City • Phoenix • Portland • Pueblo • Salt Lake City San Francisco • San Leandro • Seattle • Spokane • Wichita

In the East: WICKWIRE SPENCER STEEL DIVISION—Atlanta • Boston • Buffalo • Chicago • Detroit New Orleans • New York • Philadelphia • CF&I OFFICE IN CANADA: Montreal

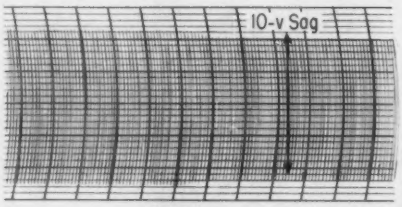
CANADIAN REPRESENTATIVES AT: Calgary • Edmonton • Vancouver • Winnipeg

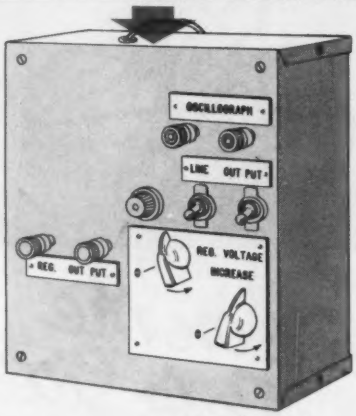
'Welder' Voltage

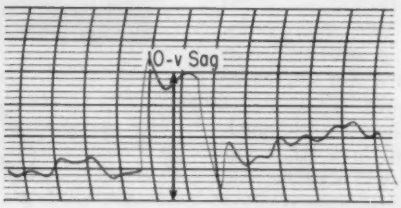
PHILIP T. HOWE, *Laboratory Technician, Consumers Power Co, Jackson, Michigan*

Elimination of the base voltage from oscillograph pen tracings allows the full scale to be used in showing the bus voltage variation during operation of an electric spot welder. This is the technique used in a new instrument which, in effect, can amplify the variation in voltage to the full scale of the oscillograph and makes it much easier to determine the actual voltage sag.

Determining the bus rigidity of an electric spot welding circuit has been complicated because the voltage sag is small compared to the total voltage. The sag is compared to a 120-v ac base obtained at the primary metering or with a step-down transformer. It is usually 10 v or less on a 120-v base. Generally only the magnitude of voltage sag is desired; there is no concern with wave shape.







Mobile Sub Serves Unit

H. L. SWICEGOOD, *Chief Engineer, Brockton Edison Co, Brockton, Mass*

Power during emergencies or scheduled outages at unit substations and other locations is supplied with a 3,750-kva, 13.8-4.16/2.4-kv completely-enclosed mobile substation. This unit, developed by Brockton Edison Co, can be used safely anywhere on the system without an enclosing fence or the stationing of a guard while it is energized. An aluminum H-frame allows the mobile sub to be used at other than existing substations wherever suitable subtransmission and distribution primaries are available.

Need for a unit offering maximum safety to the public was influenced by the proposed use at unit-type distribution substations, which are not fenced and have underground incoming and outgoing circuits, and at other remote locations. Thus, the mobile substation has all equipment housed in a sheet-metal enclosure mounted on a semi-trailer. It uses insulated leads for connections to overhead lines. The unit was designed by Westinghouse Electric Corp.

The transformer in the unit is rated 3,750 kva, FOA, 13.8 kv delta to 4,160/2,400 v, with full capacity high-side taps at 14.145, 13.8, 13.11, 12.765, 12.42 and 12.075 kv. This gives a high-to-low voltage tap ratio of 5:5.9, which encompasses the range of distribution substations on the system.

Sag Boosted

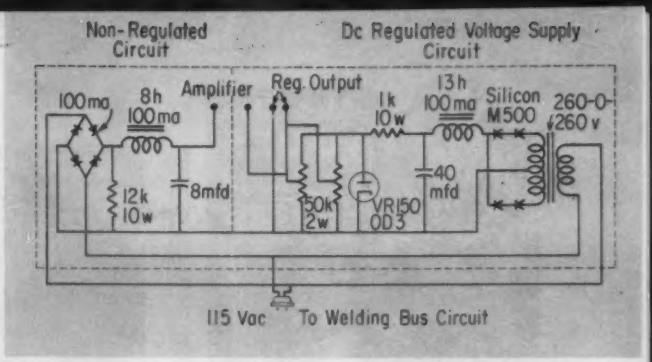
A pen-inking oscillograph has been used with an ac amplifier equipped with an attenuating circuit. When the oscillograph was fed with a 120-v ac base voltage, the pen deflection was adjusted to give a 24-mm deflection, or 5 v per mm. If the welder caused a 10-v sag the pen deflection was 2 mm. When the voltage changed less than 10 v it was difficult to determine the change from the oscillogram.

The problem has been solved with an instrument that eliminates the 120-v base from the pen deflection and records only the sag voltage. This greatly increases the deflection per volt of sag without exceeding the 24-mm deflection of the oscillograph.

The instrument has two circuits. One is a dc regulated power supply with adjustable voltage output; the other, a non-regulated ac input circuit that is rectified and filtered to give a dc output.

The output of the regulated power supply can be varied from 0 to 150 v dc and is adjusted to equal the base voltage of the welding circuit. Range of the base voltage is obtained from the welding circuit through a step-down transformer.

With the two voltages equal, there is no difference in potential between them. When the bus voltage sags due to welder operation, dc output of the non-regulated circuit changes and creates a difference of potential between the two circuits. This difference is fed into a dc amplifier which can be adjusted to give the desired pen deflection.



As long as the voltages on the two circuits are equal, there is no signal to the pen motor so it remains at its mechanical zero. When the bus voltage of the welding circuit changes, the change is fed to the pen motor. The trace on the oscillogram is no longer a 60-cycle trace, but is shown by a stepping motion of the pen. A 10-v sag now is shown by a 24-mm deflection, or 0.416 v per mm. In practice a more convenient and accurate scale is used.

Filtering circuits in both regulated and non-regulated supplies have time constants so there is a limitation to the voltage-sag time. This time cannot be less than two cycles because the voltage cannot build up its peak in the filtering circuit before the wave starts to decrease. Therefore, there is peak clipping. However, most welders have a welding time of about six cycles so these time constants are not objectionable. Accuracy of the instrument is 0.75% with a 20-v sag and 0.1% with a 40-v sag in bus voltage.

CIRCLE 95 ON READER SERVICE CARD

Distribution Substations

The mobile substation is equipped with a 400-amp automatic circuit recloser on the high side; an oil-filled disconnect switch on the low side capable of breaking exciting current; high and low-voltage lightning arresters; and an auxiliary transformer on the high-voltage end for control, lights, pump, and air blast fans.

The recloser is electrically interlocked to prevent operation of the low-voltage disconnect switch when the unit is energized from the high side. A thermal relay operates the high-voltage recloser should maximum safe operating temperature of the transformer winding be exceeded.

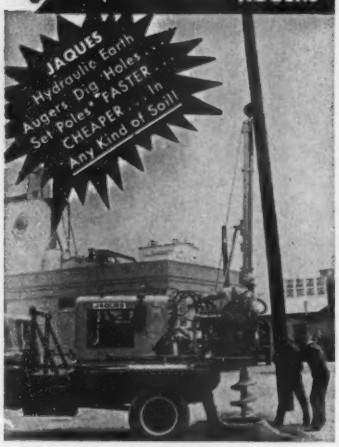
High and low-voltage cable entrances are provided on top of the substation at each end for bringing in cables from overhead. High-voltage cables are brought directly to the recloser; low-voltage cables are taken directly to the low-voltage bushings on the disconnect-switch terminal chamber. Primary cables are 2/0 extra-flexible copper with 25/64-in. rubber-like insulation, woven tinned copper braid shielding and a 6/64-in. NS jacket. Secondary cables are 750-MCM (127 strand) with 12/64-in. rubber-like insulation, tinned copper braid shielding and 7/64-in. NS jacket.

Hot-line clamps are provided for line connections on both high and low-side cables. In most cases it is possible to bring the cables from the mobile substation directly to the overhead lines. Where this is not possible, an H-frame structure, which can be quickly assembled on top of the enclosure, provides for the running of both primaries and secondary wires in either direction to 13.8-kv and 4.16-kv lines. Cables are brought up and attached to these lines.

As the substation is to be used during planned routine maintenance or emergencies, permanent facilities are available at all substations where we plan to use the mobile unit so that it can be put into service quickly. These facilities consist of disconnects conveniently installed, with upper terminals connected to 13.8-kv and 4.16-kv lines.

Phasing on both high and low sides is marked so that the substation crew can make all connections to the lower (dead side) of the disconnects and put the mobile substation into service without delay. Detailed sketches showing the exact position where the unit is to be placed, tap settings, phasing, and method of connecting have been drawn up for every possible substation where the mobile unit may be used. The mobile substation normally is garaged on a concrete platform under a car-port type shelter, with the cables coiled on its top, so that it can be moved readily and set up quickly.

ARMY and NAVY Also Use JAQUES Hydraulic EARTH AUGERS



*Pole-setting attachment optional.

ARMY REPORT ON JAQUES KJ-254**

"There was a performance test on Pilot Model (Jaques Earth Auger), Model KJ-254, built by Texoma Enterprises, Inc. This test performed in accordance with Military Specification Mil-A-516B, paragraph 3.9 through 3.9.2.

"This test was performed in sandy, gravelly, red clay, hard and dry to blue silty clay at bottom of hole. Average time per hole for 25 consecutive holes was 78 seconds. Average depth of holes was 67.2 inches. Machine functioned at normal temperature."

**JAQUES newly developed Model TJ-254 is 2½-TIMES FASTER than Model KJ-254!

Some of 29 JAQUES TJ-254's NAVY bought.

WHY BUY JAQUES?

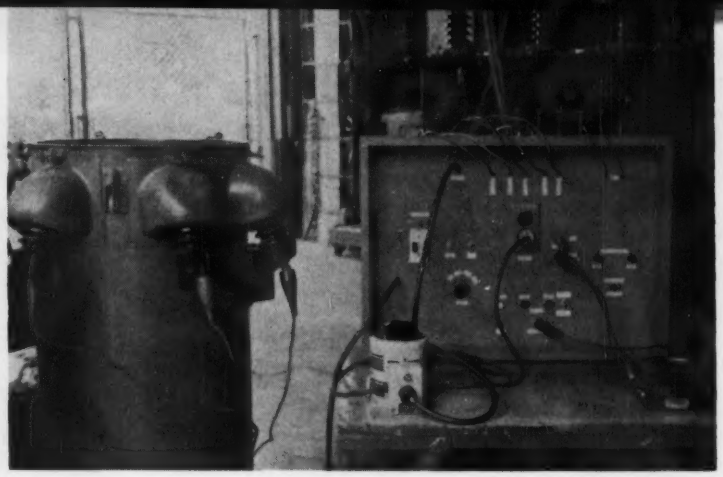
1. JAQUES Augers have finger-tip, feather-touch controls . . . only 3 primary adjustments for easy, simple operation . . . Mount on standard trucks . . .
2. JAQUES drill holes up to 60" diameter . . . up to 25' deep in toughest soil . . . even in rock . . . FASTER, CHEAPER . . .
3. JAQUES have fewer moving parts for longer life . . . lower maintenance and operation costs . . . less "down time" . . .
4. JAQUES dig holes up to 45° angle, either side of truck . . . Patented pressure control takes strain off all parts when rock drilling . . .
5. FIRST Jaques built 29 years ago is STILL IN OPERATION!

MAIL TODAY!

EXOMA ENTERPRISES, Inc.
Manufacturers of JAQUES Earth Augers
HIGHWAY 75 NORTH, SHERMAN, TEXAS

☐ Send me FREE detailed literature.
☐ Have representative call. No obligation.

NAME_____
TITLE_____
ADDRESS_____
CITY_____ STATE_____



Portable Simulator Tests Line Voltage Regulators

P. R. ILER, Maintenance Foreman, Ohio Power Co, Bucyrus, Ohio

A portable test panel working on low voltage rather than on line voltage saves up to 2 hr for each regulator tested. The panel includes a megger feature to detect low resistance insulation. While the panel allows twice the number of regulators to be routine-tested in the same time, of greater importance is the time saved when checking a faulty unit. Furthermore, the test set reduces the time required to train men to make these tests.

Routine adjustment tests for line voltage regulators require three separate wiring setups. An additional wiring setup is required for trouble shooting. The bulkiness of high-voltage cable and connectors virtually eliminates the efficient packaging of the required four test setups. The spaghetti-like nature of the temporary leads normally used in a high-voltage regulator test compounds the job of teaching the test procedure to a new man.

Low-voltage equipment, by nature small in size, lends itself well to compact panel packaging. Furthermore, because more than 90% of the trouble found in faulty regulators is either mechanical or in the low voltage control circuit, most regulator difficulties can be readily detected by the simulated test method. Because the low-voltage test will not detect low resistance insulation, a megger check is included in the test sequence.

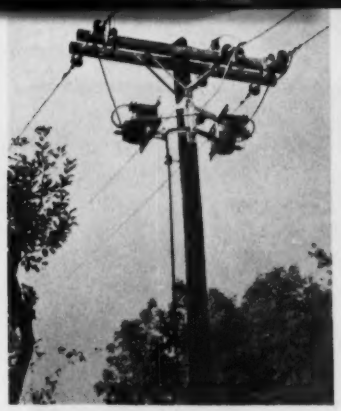
The portable test panel is designed so that each of the four test setups can be activated by merely throwing the proper switches. A variac and two portable indicating volt-meters (0-10 v and 0-300 v) are the only auxiliary items needed. Safe grounding and correct polarity of the test set and of the regulator circuit are insured with lamps and polarized-type connectors.

With this panel, all line voltage regulators are checked for:

Percentage voltage change per tap and ratio between windings.

- Continuity through high-voltage windings and contacts.
- Output voltage level.
- Burned or loose connections in tap-changing type regulators.
- Fouled or gummy rotor bearings (indicated by jerky voltmeter readings).
- Improper brake adjustment (indicated by voltage fluctuations).
- Position of indicator dial.
- Improper band settings.
- Proper control setting.

Although most of the testing is done in the shop, recent experience has shown that it is well worthwhile to have the 20x28x8-in. self-contained test unit available for trouble shooting in the field. The wired panel-kit weighs less than 10 lb and if assembled using new material, the total cost would be about $25.



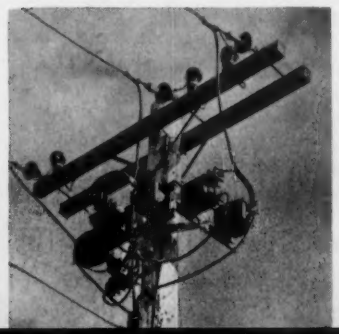
Preassembled Pole Top-Metering Cuts Labor Costs

A. D. FELLENZER, JR, Electrical Engineer, Engineering Dept, Orange & Rockland Utilities, Inc, Middletown, N. Y.

A new standard pole mounted primary metering preassembly, recently adopted by Orange & Rockland Utilities, Inc, requires less pole span than crossarm mounting, as well as less labor and material per installation—no fabrication or interconnection wiring is required in the field.

The new unit uses the "building block" approach in order to accommodate 2 or 3 element metering. A "building block" consists of one potential and one current transformer. Thus, 2 or 3 "building blocks" may be used for the assembly.

The potential and the current transformers (butyl molded, out door type), making up the building block, are mounted on two channels included with the metering transformers. These building blocks are then shop assembled on the cluster mount and the secondary wiring completed. A control cable down lead is attached to the assembly in the shop so that the unit is ready to install. The line crew installs the assembly and makes primary connections.



1*

*1 — that's right, *just one.* It's the only one of its kind because it was tailor made by Nelson for a major utility company for a specific purpose. It is, however, a good example of Nelson's "Controlled Power Package" which includes motor control centers, low voltage switchgear, high voltage starters, supervisory and special control, and other equipment in a single weatherproof structure, all interwired, ready to hook up to line and load.

This approach means important savings because Nelson takes on the detailed engineering required for coordination and interconnection, and also eliminates the necessity of engineering a separate building. You spend your money where it counts—on the electrical equipment.

This new approach to customer service again confirms the fact that Nelson is

BIG ENOUGH TO PERFORM
SMALL ENOUGH TO CARE

Be sure to let your Nelson representative figure your next job. You will find him listed in the Yellow Pages of major city telephone directories.

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

P. O. BOX 5385 NATIONAL 7-5530

CIRCLE 97 ON READER SERVICE CARD

NEW TYPE S&R CROSSARM ROLLERS

SPEEDILY AVAILABLE
LOW IN COST
ALWAYS DEPENDABLE

No. 9811
Nail or bolt to crossarm

No. 9812
Clamp on crossarm or suspend from insulator string

No. 9821
For turning corners

No. 9822
For going up and down hill

Each of the four designs is available with easily interchangeable cast iron or aluminum rollers. Three types of bearings. Plain bore or bronze bushed rollers 3¾" diameter. Ball bearing rollers 4½" diameter.

NEW CATALOG on complete line of S&R Conductor Stringing Equipment sent on request.

SHERMAN & REILLY, INC.
ENGINEERS AND MANUFACTURERS
1ST & BROAD STREETS - CHATTANOOGA 2, TENNESSEE
TELEPHONE AMherst 7-1273 TWX CT-7036

CIRCLE 43 ON READER SERVICE CARD

"Better Holes by Heck!" WITH THIS

.... Self-Powered
HOLE DIGGER

• The low-cost, fast way to dig holes. Fits on any A-frame. No expensive installation. Digs holes up to 8 ft. deep and 20 in. in diameter. One man operates digger with all controls mounted on machine. Made in 9-hp. and 18-hp. models. Auger is cleaned by spinning. Electric starter available. Digs anchor holes with ease. Operator shielded from moving parts. Film of machine in operation available. Write for descriptive bulletin.

HECKENDORN MFG. Co.,
CEDAR POINT, KANSAS
Tel.: BRoadway 4-3745

Checker Insures

WILLIAM E. SELL, Transmission Inspector,

ROBERT F. TANNER, Senior Transmission Engineer, Indiana & Michigan Electric Co, Fort Wayne, Ind.

A batter-checking device used in conjunction with stub leg measurements has proven of great value to transmission construction inspectors of Indiana & Michigan Electric Co. Inspectors now can check alignment of tower foundations in half the time and with improved accuracy. The batter-checking device is especially valuable for footings set in sandy soils with a high water table, since inspectors do not have to go down into the excavation and are not exposed to the hazard of cave-in.

The new method supersedes the use of stakes and chalk lines in establishing correct batter and alignment. The batter-checking device is made by installing two spirit levels on a 4x14x¾-in. piece of plywood which is shaped to fit accurately inside the angle of the tower leg section. One spirit level is mounted to the board so that its longitudinal axis is perpendicular to a vertical plane passing through the leg and the center of the tower. A second

Tower Leg Alignment

level in an adjustable frame is mounted so that it is parallel to this same vertical plane and can be adjusted to be level at the correct slope or batter for the particular tower design. Cost of the device, including materials and labor, is $3.

With the device held snugly against the inside of the angle leg, alignment can be checked in two directions simultaneously. In practice, the stub leg batter angles are checked with the device and, if correct, these measurements then are taken:

1. The diagonal distance (normally referred to as the "Y" dimension) between each of the four stub legs and the tower center hub.
2. The distance between each of the four stub legs and the centerline of the tower (normally referred to as the "X" dimension), which is one-half the distance between corners of adjacent legs.
3. The total distance (2 "X") between stub legs 1 and 2 and legs 3 and 4.

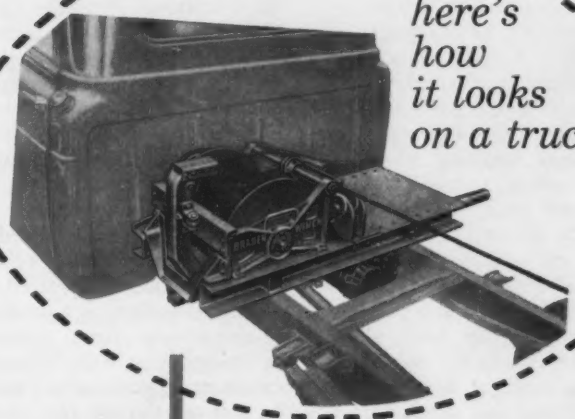
All measurements are taken at the top of the stub leg at the back of the post angle. This combination of checks always insures proper alignment of the tower foundations before and during the backfilling operation.

a winch so unusual

we don't know how many uses it has!

here's how it looks inside

here's how it looks on a truck



BRADEN CL WINCH

This BRADEN CL Winch was designed primarily for utilities. It will draw wire or cable at a CONSTANT SPEED until the winch drum is completely filled! *This has not been possible before.*

We believe there are many uses for the new CL Winch. Maybe it will help solve a winching problem for you where CONSTANT SPEED is desirable. Write for complete information on this unusual CL Winch, or let us know if you would like for a representative to call on you. We believe we've really got something.

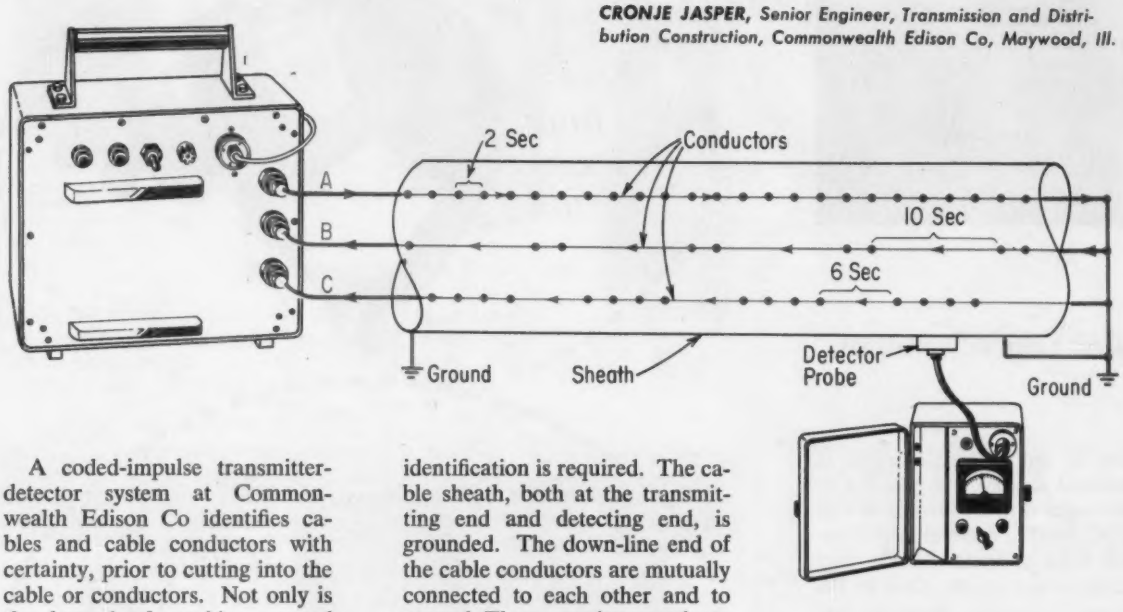
BRADEN WINCH DIVISION OF MOTOR PRODUCTS CORPORATION

P. O. BOX 547 • BROKEN ARROW, OKLAHOMA

"In Service Around the World"

Code Identifies Conductors With Sureness

CRONJE JASPER, *Senior Engineer, Transmission and Distribution Construction, Commonwealth Edison Co, Maywood, Ill.*



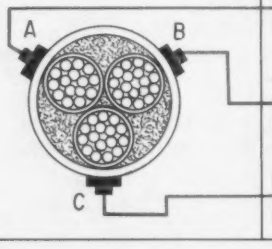
A coded-impulse transmitter-detector system at Commonwealth Edison Co identifies cables and cable conductors with certainty, prior to cutting into the cable or conductors. Not only is the hazard of working around energized cables reduced; but also, the total outage time from beginning to the end of a cable job can be cut considerably.

The coded-impulse system consists of a transmitter and a detector. The transmitter leads are readily connected to the conductors of the cable at an up-line terminal—here, the conductors are tagged. The detector sensing-probe is positioned over the cable and conductors at the distant working location where conductor identification is required. The cable sheath, both at the transmitting end and detecting end, is grounded. The down-line end of the cable conductors are mutually connected to each other and to ground. The transmitter produces a distinctive signal code for each of the tagged conductors. The detector interprets the coded signals and thereby identifies the cable and conductors involved.

The transmitter is a condenser discharge-surge signal generator. A timing device in the transmitter causes an impulse-surge signal to be sent out through one conductor, say the A-conductor, every two seconds. The return pulse discharge signals are alternately switched in the transmitter, between the mutually connected B and C conductors. The switching is timed so that the first two transmitted impulses return through the B conductor, and then the next four transmitted impulses return through the C conductor. This cycle repeats continuously to produce a distinctive coded signal over each of the three conductors.

The detector consists of a hand sensing-probe, or exploring coil, a control amplifier, and a zero-center microammeter. When the sensing probe is positioned over the A conductor, the magnetic field produced by the transmitted impulse current, causes the pointer of the detector-meter to be deflected in one direction, say to the right, every two seconds. The two second pulsing is continuous if the probe remains over the A conductor. When the probe is shifted to a position over the B conductor the pointer will be deflected twice to the left, two

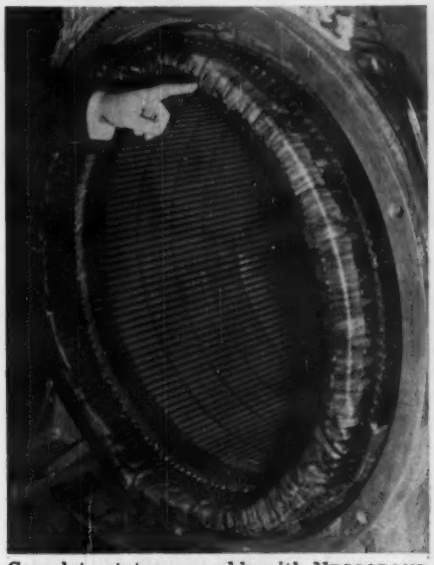
(Continued on page 102)

Position of Probe & Conductor	Meter Indication
	Pulse to the right every 2 sec pulses twice to left (once every 2 sec) followed by a 10-sec pause pulses four times to left (once every 2 sec) followed by a 6-sec pause

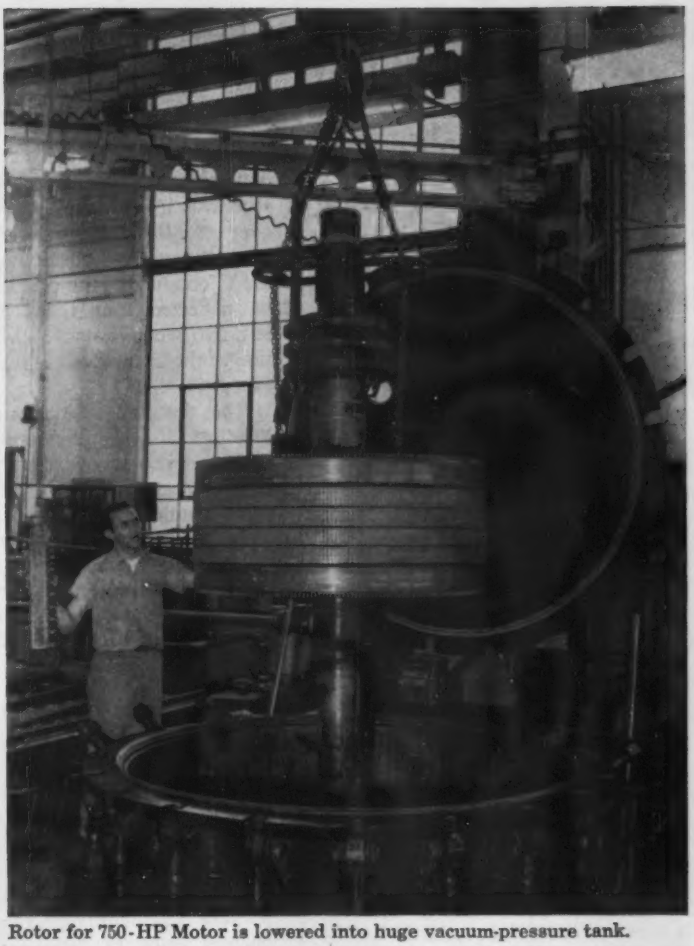
For maximum motor life...

NATIONAL VACUUM-IMPREGNATES THE COMPLETE MOTOR WITH EPOXY

National offers superb facilities for rewinding and rebuilding rotating electrical machines...such as this large vacuum tank used in impregnating insulations with super-strong Epoxy resins. Not only single coils, but complete rotor and stator assemblies for large motors are regularly handled in this equipment.



Complete stator assembly with NECCOBOND insulation system, after vacuum impregnation with Epoxy resins.



Rotor for 750-HP Motor is lowered into huge vacuum-pressure tank.

This process, used with the NECCOBOND insulation system provides these assurances of maximum service life:

- the insulation wall is completely void-free, with all interstices filled with resin to provide maximum heat conductivity.
- the exceptional mechanical strength and adhesion of Epoxy resin bonds the entire winding and core into a solid mass.
- uniform encapsulation provided by National's method of baking, insures high degree of protection against moisture.

Whether your electric coil and rebuilding needs are standard or special, you'll be sure of performance when you call in National Electric Coil. We tailor-make the coils to fit your needs, offer all types of insulation. For information call National's Columbus plant ...HUdson 8-1151...or check the nearest National field engineer.

NATIONAL COILS

National Electric Coil

COLUMBUS 16, OHIO • IN CANADA: ST. JOHNS, QUEBEC

DIVISION OF McGRAW EDISON

CIRCLE 101 ON READER SERVICE CARD 101

Save Time, Money Speed Installations with . . .

P-W

CABLE SUPPORTING SYSTEMS

P-W's TYPE "E" (PUNCHED BOTTOM) TRAYS—FOR POWER AND CONTROL CABLES AND INSTRUMENT TUBING—ALTHO LESS EXPENSIVE, ARE STRONGER, VERSATILE AND SUPERIOR. CONTROL CABLE CAN BE DROPPED OUT ANYWHERE.

Engineers, Contractors and Installers look for QUALITY, LONG LIFE, AND LABOR SAVINGS in their supports. That's why more and more users are turning to P-W. Among our outstanding improvements are: CONNECTIONS that are quick and easy to install—PRE-CUT SYSTEMS saving installation time—EXTENSION CONNECTORS eliminating field cutting to complete runs — ADJUSTABLE HORIZONTAL and RISER CONNECTORS to go over, under or around pipes, trusses, columns, etc. — BUILT-IN ADJUSTABLE DROP-OUT SECTIONS eliminate cutting out bottom of tray — STRAIGHT SECTIONS available in lengths up to 16' (33⅓% less connectors and less installation time over 12' lengths).

P-W SUPPORTS are available in hot dip galvanized steel or aluminum, in LADDER, EXPANDED METAL and SOLID TRAYS in addition to Type "E". All systems are interchangeable. Write for Catalog 858-A.

For the utmost in service, contact the appropriate Representative in your territory or P-W direct, regarding inquiries and placing orders.

P-W INDUSTRIES
11200 Roosevelt Blvd.
Philadelphia 15, Pa.

Code Identifies Conductors

(Continued from page 100)

seconds apart—the two left hand deflections are repeated every ten seconds, if the probe remains over the B conductor. Finally, when the probe is positioned over the C conductor, the pointer will be deflected four times to the left, two seconds apart—this portion of the signal cycle is repeated every six seconds.

The detector, at the working location, first identifies the cable to be worked by sensing the existence of any of the three signals in the cable. Then the detector identifies the specific conductors of that cable by the distinct signal code indicated for each—prior to cutting into the cable sheath.

Transmitted impulse signals are readily differentiated from sheath or stray signals, thus eliminating the possibility of false identification. Sure identification eliminates the hazard of cutting into an energized cable by accident, and obviates spearing of the cable to prove that it is not energized. The hazard of working on bare conductors is decreased because by identifying the conductors prior to disturbing the insulation, the total time during which exposed conductors can accidently be energized, is minimized.

Cable labor costs at Commonwealth Edison Co, for instance the cost of splicing, are reduced with the coded-signal conductor identifier because it is no longer necessary to stop splicing to identify the conductors, and because no work is involved in disconnecting and reconnecting the transformers at the down-line end of the cable. Also, by cutting down on the total splicing time, cable outage is reduced to the point where cable work can usually be done on weekdays between peak load periods—weekend overtime work is minimized. Furthermore, because a minimum of training is required for operating the transmitter-detector equipment, the high cost of specialized crews is avoided.

(More Maintenance on page 103)

Universal Ground Anchors

Were created knowing that a device should be developed which would provide satisfactory ground anchoring facilities in all types of soil.

This Ground Anchor is the result and can be used in practically any soil. It may be quickly and easily installed and is very efficient. Send for Brochure.

BARTLETT MFG. CO.
3048 E. Grand Blvd., Detroit 2, Mich.

CIRCLE 44 ON READER SERVICE CARD

New DISTRIBUTION TRANSFORMER TESTERS

Distribution transformers up to 250 kva capacity can be accurately tested with new MULTI-AMP Transformer Test Sets. Units may be used with all transformers having primary winding ratings of 2.4 to 15 kv and secondaries rated 120/240 v. Makes six measurements including primary voltages, exciting currents, no-load loss, high voltage output, polarity and ratio.

Standard models available to test transformers from 25 kva to 250 kva.

Write for Bulletin TTS-250.

MULTI-AMP®
DIVISION
MULTI-AMP ELECTRONIC CORPORATION
465 Lehigh Avenue • Union, New Jersey

CIRCLE 45 ON READER SERVICE CARD

Recloser Testing

(Continued from page 84)

stops when current ceases. The simulated arc current time is varied by simple potentiometer adjustment to accommodate the arcing characteristics of the variety of reclosers. The multi-range ammeter, equipped with a pointer pre-set, facilitates the reading of short duration currents.

Last year, on a scheduled basis, WMECo pulled all its reclosers into the shop for complete overhaul and extensive testing. Many mechanical failures were found, such as poor gaskets, cracked bushings, and rusted lock open latches. In addition to the easily detected mechanical failures, numerous reclosers were found out of sequential operation, inoperative due to faulty relay contacts or adjusted for excessive minimum tripping currents.

Western Massachusetts Electric has approximately 95 three-phase type reclosers on distribution lines and in substations. Also, 170 single-phase reclosers of the hold closed type are utilized. It is now standard practice to conduct extensive electrical and operating acceptance checks on all new reclosers before field installation. Field maintenance checks are periodically accomplished with the portable tester.

The first field maintenance test is conducted after the recloser has been in service about a year. At this time the recloser is throughly checked for loose bolts and nuts, faulty gaskets, correct counter and lock open operation plus proper electrical operation.

Complete inspection, operation tests and an oil change are accomplished after 100 operations for single phase reclosers, and after 75 for three-phase reclosers.

We have a few reclosers that are installed in substations where their interrupting current is near the maximum rating of the recloser. These are tested more frequently.

The simplicity of Multi-Amp testing routines are best exemplified by the step-by-step procedure listed in the block above.

(More Maintenance on page 104)

CIRCLE 43 ON READER SERVICE CARD

Truco
DENVER

UNIVERSAL
TURRET DERRICK

YOU GET the derrick position you want when you buy Truco. Here are all the fine features of the famed Truco Turret Derrick now offered in your choice of *three* mounting positions for the job best suited to your truck body. Not only that, Truco offers full 360° rotation of the turret. You spot the load where you want it, dig the hole, set the pole with the positive safety and dependability of hydraulic operation.

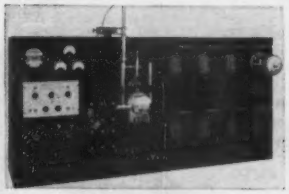
Unitized Construction
Full 360° Rotation
No Exposed Moving Parts
8,000 Pounds Capacity
Digger Staws Automatically
30 Foot Sheave Height
Adapts to Standard Line Bodies
Optional 1-Man Fiberglass Basket

See your Truco dealer or representative for full details or write for illustrated literature.

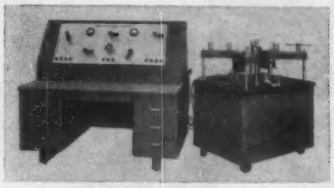
TRUCK EQUIPMENT CO.
3963 WALNUT STREET / DENVER 5, COLORADO

CIRCLE 103 ON READER SERVICE CARD

TAKE ADVANTAGE
OF THE EXTRA FEATURES
IN STATES TEST TABLES



COMBINATION WATTHOUR AND
DEMAND METER TEST TABLE



5,000 AMP. CURRENT AND
POTENTIAL TRANSFORMER TABLE

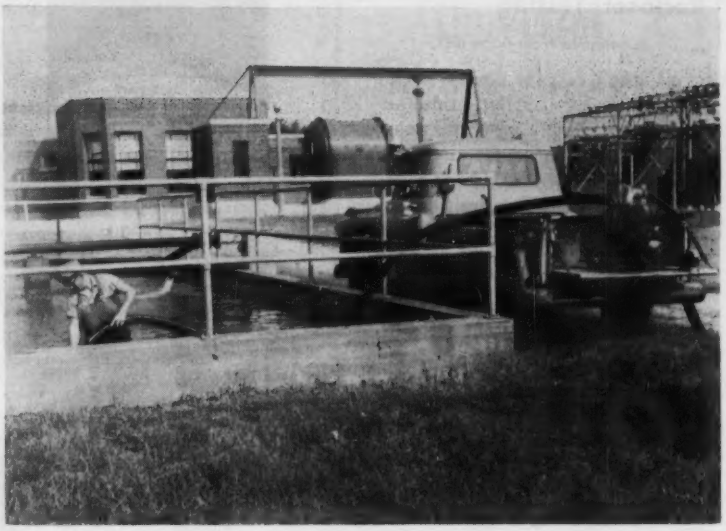
GANG TEST TABLE
WITH PHOTO ELECTRIC CONTROL

ROTATING STANDARD
CALIBRATING UNIT

THE STATES COMPANY
Parts Handpunch

Write for full details on Test Table Line

THE STATES COMPANY
3 New Park Ave., Hartford, Conn.



Cooling Pond Vacuumed While Condenser Operates

VIRGIL McCLURE, Substation Foreman, Indiana & Michigan Electric Co, Benton Harbor, Michigan

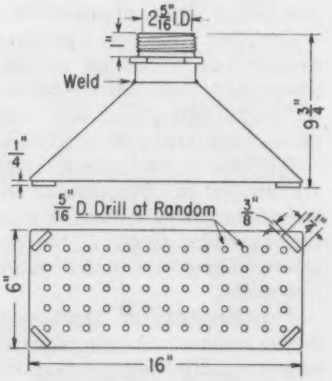
A job-fabricated hose attachment is used at Indiana & Michigan Electric Co to "vacuum" clean a condenser cooling water spray pond in twelve man-hours without draining it. The condenser need not be taken out of service for the cleaning operation. Also, 30 man-hours per year, plus the cost of new water-softening chemicals, are saved.

Previously it took a day to drain the pond, a second day for three men to clean it, and five more days before the water softening equipment produced enough treated water to start the condenser again —the condenser was out of service for a full week whenever the pond had to be cleaned.

The "vacuum" hose is fitted to a 3-in. hose leading to a self-priming water pump. The funnel-shaped head with perforated sheet metal bottom spreads over 96 sq in. of pond bottom. Pieces of ¼-in. steel are welded to funnel corners to keep its working surface just high enough above the pond bottom to permit removal of the maximum sludge, while drawing in a minimum of water.

To use the "vacuum," the operator puts on waders and moves the "vacuum" funnel head along the bottom of the pool. The sludge is pumped out as a watery slurry. Moving slowly, the operator keeps the head well ahead of himself to minimize stirring up of the sludge.

The pond loses only 6 to 8 in. of its depth in the process of complete cleaning so that the condenser can be kept in service.



(More Maintenance on page 106)

ONLY CRESCENT OFFERS THIS COMPLETE LINE!
Crescent—2 sizes, 15" and 18". Black finish.
Crescent—5 sizes, 4" to 12". Black finish.
Crestolock—3 sizes, 8", 10" and 12". Chrome finish.
Crestoloy—3 sizes, 15", 18" and 24". Chrome finish.
Crestoloy—5 sizes, 4" to 12". Chrome finish.
Crestoloy—4 sizes, 4-6" to 10-12". Chrome finish.

NONE BETTER ANYWHERE!

CRESCENT and CRESTOLOY Wrenches are made by the originators of the 22½° adjustable wrench. They have been widely copied but never equalled for design, balance, quality and all-around performance. The buyer who wants top value in tools insists on CRESCENT.

Sold by hardware dealers and industrial distributors everywhere.

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

'Life Guard' Hats & Caps

The best in head protection for electrical/construction workers

Jackson's 'Life Guard' safety hats and caps safely resist over 20,000 volts, and they also provide impact resistance to more than satisfy federal requirements for safeguarding construction workers.

'Life Guard' safety caps have narrow brim around sides and back, visor in front. Injection molded plastic is strong yet flexible, has a soft comfortable feel. Caps may be ordered with attached welding helmets, goggles, and assorted face shields.

Standardize on this all-purpose safety hat for maximum head protection. Identify work categories by issuing these different hat colors: white, yellow, grey, and orange.

'Life Guard' safety hats offer neck protection with wide brim all around. The 'Life Guard' headgear is instantly adjustable in hat sizes, and its comfort keeps the hat where it does its job, on the worker's head. Chin straps and warm winterizers are available.

Sold by better welding supply and safety product dealers everywhere

Jackson Products

AIR REDUCTION SALES CO., A DIVISION OF AIR REDUCTION CO., INC.

31739 Mound Road, Warren, Michigan

CIRCLE 46 ON READER SERVICE CARD

CHANCE TWO-TON HOIST

*... the linemen's choice**

This big brother to the popular Chance One-Ton Hoist is a Two-Ton Hoist with the same mechanical simplicity—plus precision gearing that doubles load capacity.

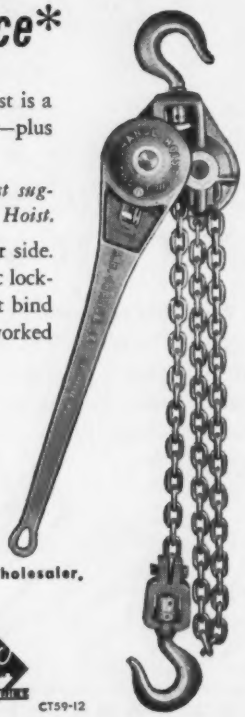
* *It has all the features linemen from coast to coast suggested in helping to develop the Chance One-Ton Hoist.*

Easy-to-grip well-balanced handle operates from either side. "Free-wheeling" for ease in hooking to load. Automatic locking prevents accidental dropping of load. Chain won't bind or kink. Half or full link take up. Controls can be worked with gloves. Can swivel 360° under full load.

Rated to lift a two-ton load. Proof-tested to 6000 lbs. before shipment. Weighs only 24 lbs.

SAFETY LATCH (Photo at left) Optional at slight extra cost.

Order from your line equipment wholesaler.



A. B. CHANCE COMPANY

CENTRALIA, MO. A. B. Chance Co. of Canada, Ltd., Toronto

CT59-12

Electric Heating

Semi-Outdoor

***FRED S. WATTS, JR.** Electrical Engineer, Engineering Dept, Electrical Division, Public Service Co of Colorado, Denver, Colorado*

Prefabricated resistance-type strip heaters, infra-red heat lamps, heat cable or wire circuitry —all, are used by Public Service of Colorado to "winterize" their semi-outdoor steam power plants and substation equipment. Of significance, here, is the new concept that the size, type, and number of units to be used should be based on equipment outage time, rather than on the basis of normal plant operation.

Originally PSC applied winterizing protection on the basis of normal plant operation, rather than on shut-downs which then occurred 4 to 7% of the total available operating time. Therefore, only those items affected by seasonal atmospheric temperature changes needed to be protected. These include water and air piping, gage tubing, valves, floats, level indicators, and pressure gages—also check valves, by-pass valves, cutoff and drain cocks, in which there is no normal flow. Shutdown "freeze protection" of other piping and devices was taken care of by draining these lines, etc.

Originally, normal operation kept *some* load on *all* machines. But, with the addtion of larger and more efficient units, smaller or less efficient machines are more often removed from service. Shutdown time for the smaller units can now be in the range of 80-90% of the total operating time. Piping and equipment that had sufficient residual heat within their confines to offset freezing now have lost this self-protection during shutdown, even if thermally insulated.

Shutdowns not exceeding 48 hours create no new problems, other than protecting the enclosed "wet-bottom" areas of the boiler. This is taken care of by a space heater which prevents

Winterizes Plants

freeze-up of air-operated controllers and lines. During any type of shutdown, the large outdoor motors are protected from freeze-up of condensation by strip heaters located within the stator shield —these are put in operation automatically upon shutdown of the motor concerned.

Typical of plant equipment requiring specific winterizing are these:

• Outdoor service water pumps —Oil coagulated in drip type lubricating oil cups on outdoor service water pumps. Thinning the oil with kerosene, four parts to one is one solution. The other, dip stick heaters or low-wattage pencil type soldering irons, such as those used in printed-board and semi-conductor circuitry.

• Soot blowers—Condensate froze in the steam or air operated soot blower pilot valves, of certain soot blowers. Heavy oil, substituted for light oil in other soot blowers because leaks developed during summer, caused additional burden on air-operated motors in winter. This burden reached the stalling point at times, but caused ineffective operation of reset and limit switches in other cases.

• Rotary air compressors—Used for supply to control air lines, these units produced exorbitant amounts of water vapor in these same lines, even when filtering recommendations of the manufacturer are rigorously followed. Although reciprocating air compressors produced much less water in the lines, they do introduce oil. Overall, this type of compressor, with additional filtering beyond that recommended by the manufacturer, appeared to be one of the best solutions.

• Small air operated controllers mounted on valves can freeze-up. Normally these valves have thermal insulation surrounding them but none applied to the con-

(Continued on page 114)

Now line crews can apply ground-line pole preservative

CHAPMAN®

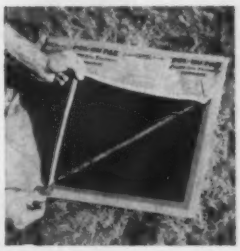
POL-NU PAK

Convenient, envelope-type ground-line treatment bandage for quick application wherever needed

Enlist your line crews in a system-wide effort to get longest service life from standing poles. With Chapman Pol-Nu Paks carried as standard equipment on service trucks, crews can apply ground-line preservative treatments to poles.

This convenient pole preservative bandage comes as a factory-sealed envelope containing Chapman Pol-Nu, the original grease-type pentachlorophenol preservative. Applied as shown in the steps below, it prevents errors and assures adequate Pol-Nu at the ground-line to restore natural loss of preservative in this critical area, resulting in many years of additional pole life.

Pol-Nu Paks are available in several sizes and, because of their convenience, are sometimes preferred for all ground-line treatment work. However, Chapman Pol-Nu in bulk containers and the Pol-Nu Bandage-Maker for preparing pole bandages in the field offer economies where many poles are to be treated. For information on both methods, using your own crews or contractor-applicators, mail the coupon below.



Slit Pol-Nu Pak on three sides to expose preservative.

Wrap bandage around pole at ground-line and staple.

Back-filling completes job, assuring longer pole life.

CHAPMAN CHEMICAL COMPANY

Leading manufacturer of wood preservatives • Memphis 1, Tenn.

Palo Alto, Cal. • Portland, Ore. • Minneapolis • Charlotte, N. C.

CHAPMAN®

POL-NU PAK

MAIL COUPON FOR COMPLETE DATA

Chapman Chemical Company
P. O. Box 138, Memphis 1, Tenn.
Please send data on Pol-Nu Pak and information on extending pole life to:

*Name*_____

*Company*_____

*Address*_____

Carrier Protects Meters in Storage and Transit

JOHN J. BOURKE, Vice President, Sales, Metropolitan Wire Goods Corp, Wilkes-Barre, Pa.

A carrying unit, recently adopted by Pennsylvania Power and Light Co provides an efficient and safe means of handling the system's meters: in transit to the testing and reconditioning plant; in temporary storage pending return-shipment; and in transit back into the field. Desirable features of the carrier are:

- rugged, stackable—absorbs transport-vibration to a significant extent.
- versatile—the same container can accommodate both the A base and socket type meters.
- open wire design provides: sure and easy hand-hold at any point; quick identification and selection; instant and continuous knowledge of the "fragile" nature of the meters.
- snug fit design—safely restrains meters, yet allows for easy loading and unloading.

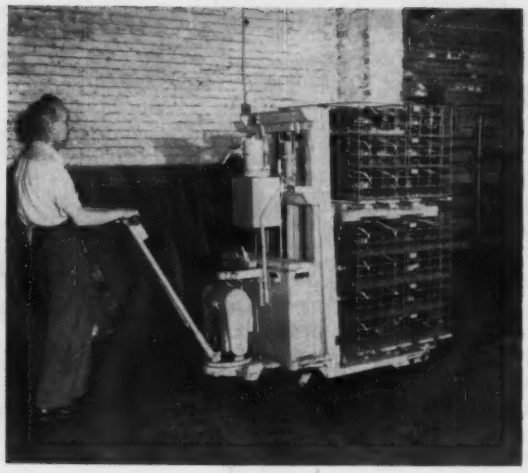
The meter carrier, called the Metro Meter Carrier, was developed by the Metropolitan Wire Goods Corp, with PP&L's System Meter Section. The unit, made of heavy gauge welded steel wire covered with Plastisol, has supported up to 5000 lb without failure. The Plastisol coating, which will not peel even if cut through to the metal, protects the meters to a significant degree by absorbing transport-vibrations and light impacts. Four meters fit snugly

Meters, from the entire PP&L system, are shipped in individual supports of the carrier.
for periodic check and reconditioning to the system meter section, Hazelton, Pa. The units are kept in the carriers while in transit to the testing plant, and remain stored therein while awaiting processing.

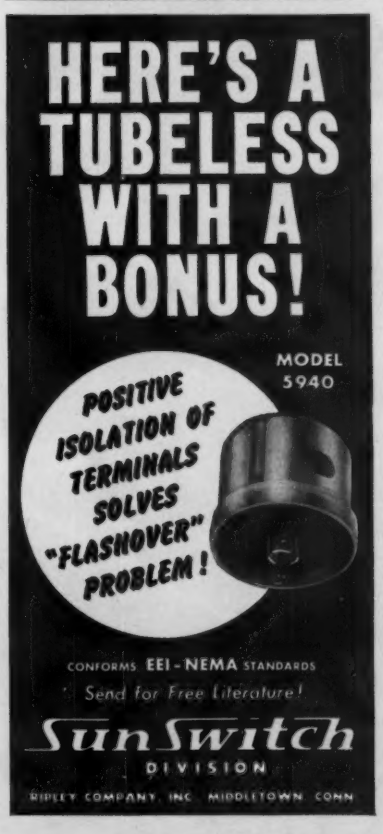
Generally speaking the carriers are stacked on a pallet, four to a row, four rows high—with two pallets to the tier. Height of four stacked carriers is 75½ inches.

Upon arrival at the testing plant an electric fork lift unloads the tiered carriers from the truck and transports them to the warehouse, where they are manually unloaded onto a roller conveyor. The conveyor transports the meter carriers to an unloading station, where an operator lifts the meters from the carrier to a work table—the carriers are returned to a second conveyor. The empty carriers then roll a short distance to the loading station. Here, tested and reconditioned meters are loaded into the carriers to be sent back into the field.

In short, the meters are protected at all times when stored or in transit.



CIRCLE 47 ON READER SERVICE CARD



CIRCLE 48 ON READER SERVICE CARD

Line Truck Storage Bins Eliminate Hazards, Save Time

EDWARD RADKE, *Wisconsin Electric Power Co, Milwaukee, Wisconsin*

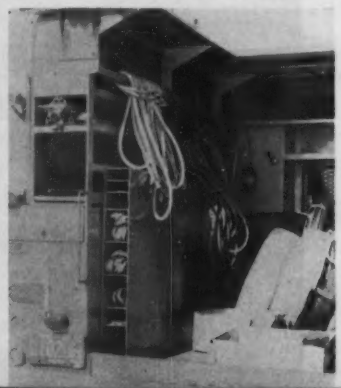
A series of bins installed in the deck of line trucks at Wisconsin Electric Power Co provides safe, efficient and handy storage of guy grips, tie wires, triplex cable grips and other "hanging" linework material.

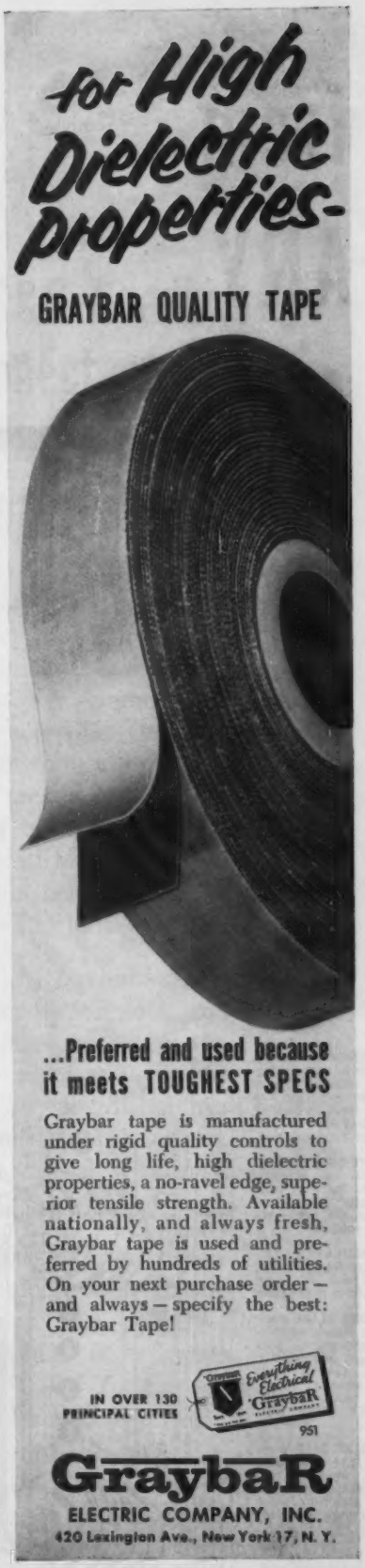
Much linework material is of such a nature as to end "hung-up" somewhere in the line truck. Whenever these items are hung on exposed hooks, they not only present a safety hazard, but often it is hard to get to them.

The special storage compartment installed in the WEPCo line trucks are comprised of 7 bins individually arranged vertically along the left side of the truck deck. The overall bin-cabinet is about 42x36x5 inches with the end opened to the rear of the truck. Each bin-shelf slants slightly downward, from the front of the bin to the rear, to prevent material from falling out. The sharp ends of the wires, guy grips, service grips and similar material are contained within these bins so that they cannot snag clothing or a workman.

The stored materials are all within easy reach of a man working on the ground to eliminate many trips onto the truck deck. Since the ends of the stored material can be seen, the various items are more easily counted by the night material loaders.

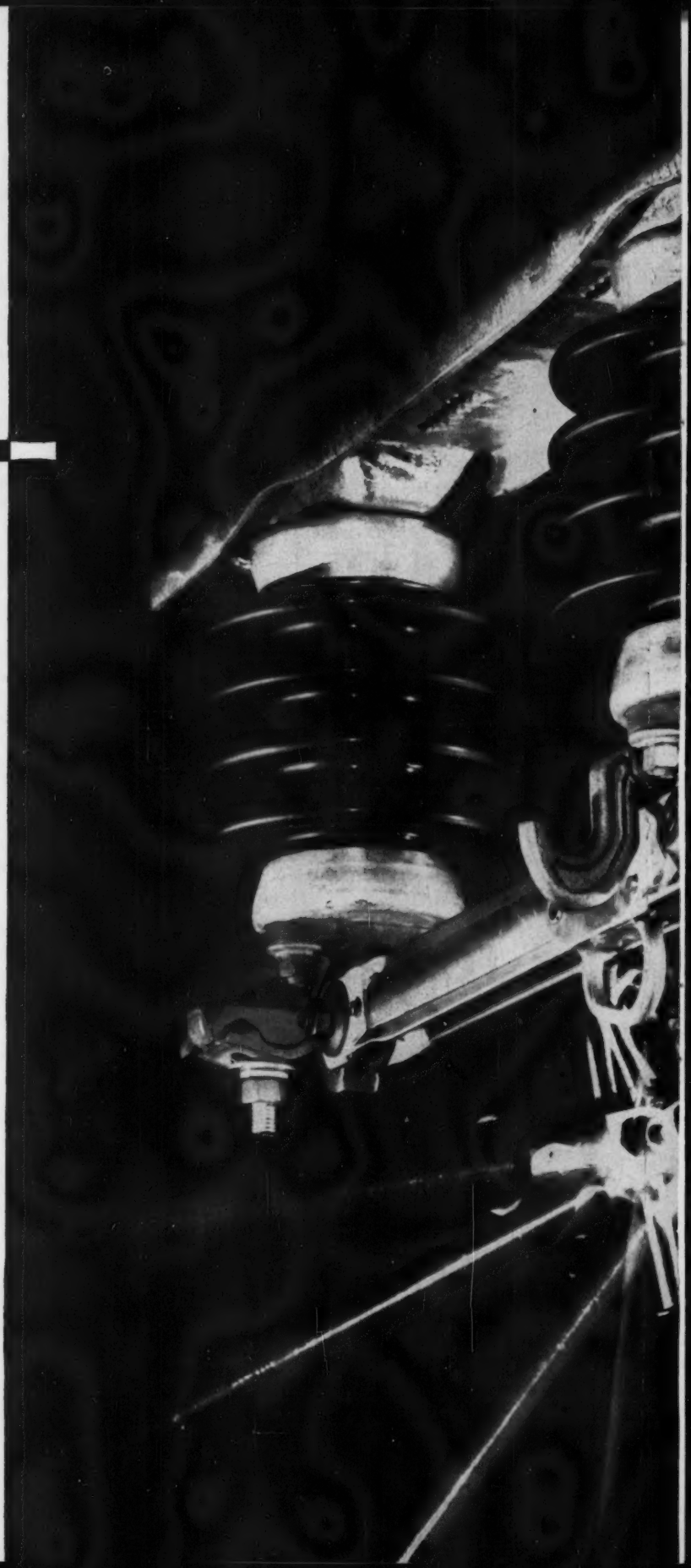
The total cost of the bins installed in an existing line truck is approximately $70. It is conservatively estimated that $130 of labor time will be saved per year for each truck in the system, excluding installation cost.




for High
Dielectric
properties-
GRAYBAR QUALITY TAPE
...Preferred and used because
it meets TOUGHEST SPECS
Graybar tape is manufactured under rigid quality controls to give long life, high dielectric properties, a no-ravel edge, superior tensile strength. Available nationally, and always fresh, Graybar tape is used and preferred by hundreds of utilities. On your next purchase order — and always — specify the best: Graybar Tape!
IN OVER 130
PRINCIPAL CITIES
Everything Electrical
GraybaR
951
GraybaR
ELECTRIC COMPANY, INC.
420 Lexington Ave., New York 17, N. Y.

CIRCLE 109 ON READER SERVICE CARD

from ANY ANGLE



1. STURDY INSULATOR. Has 5000 inch-lb. torsion strength. Means it can withstand the most severe twisting stresses when blade is closed from the side.

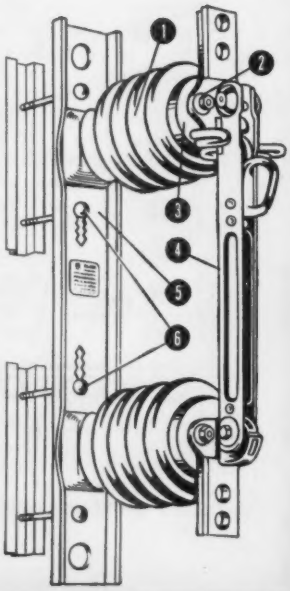
2. TWO-BOLT INSULATORS. Two widely spaced bolts on each insulator cap prevent it and the live parts from rotating.

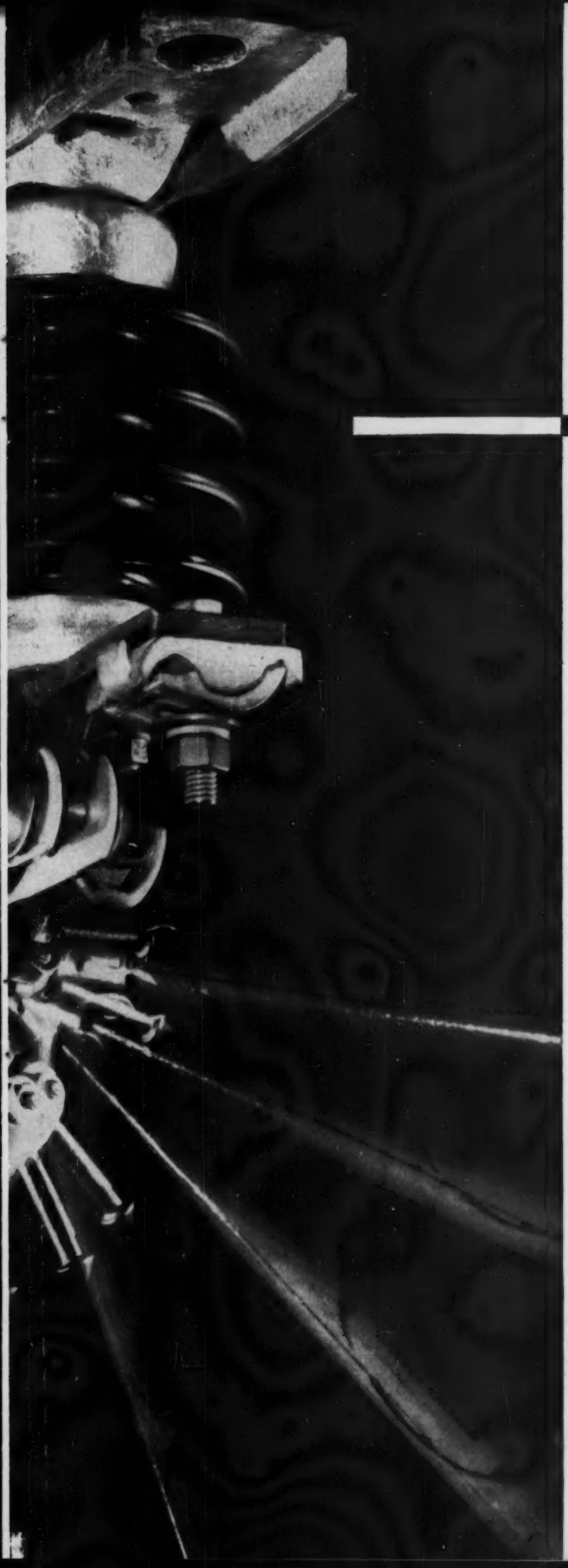
3. INSULATOR CAPS pressed from 12 gauge steel. Will not yield or deform under load.

4. RIGID BLADE won't bend. Heavy embossing and flaring adds strength and rigidity. Blade guides (which also serve as attachment hooks for LOAD-BUSTER) help steer blade.

5. HUSKY BASE made of 3/16" galvanized steel. Prevents misalignment and extensive distortion when tightening mounting bolts.

6. 4 BOLTS, 2 BACK-UPS for secure, distortion-free mounting on double cross arm.





this S&C Loadbuster Disconnect can be slammed closed without missing

This tough, rugged distribution disconnect won't twist, bend or loosen no matter how hard or from what angle it is slammed shut. To a lineman, who has to close pole mounted disconnects out on a cross arm, this means fast, positive closing. There is no chance of missing the contact or hanging up. Six of the features that help make this possible are pictured at left.

And with LOADBUSTER®, S&C's portable loadbreak tool, and LOADBUSTER DISCONNECTS, you get reliable, low-cost load switching . . . anywhere on your distribution feeders. LOADBUSTER breaks the circuit with no arc, and with no contact burning.

For more information on LOADBUSTER DISCONNECTS please write for Bulletin 721. S&C Electric Company, 4421 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 18, Ont.

S&C ELECTRIC COMPANY

CIRCLE 111 ON READER SERVICE CARD

S&C

ELECTRIC UTILITY METHODS

EUM SAFETY

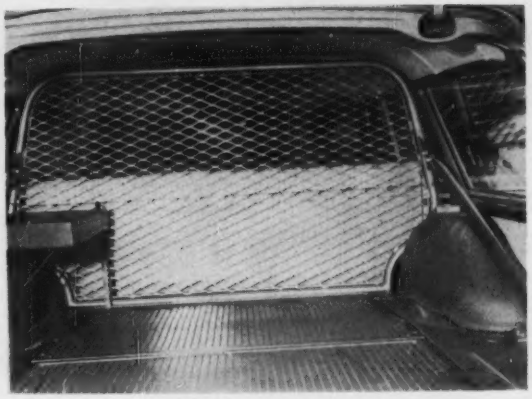
Storage Efficiency Begets Vehicular Safety

Built-in barriers and cabinets achieve vehicular safety and efficiency for Portland General Electric Co workmen by fixing equipment in place and making it more accessible. Designed, built and installed by the Safety Dept in cooperation with the Hawthorne Shop, these fixtures are installed in all crew carriers, station wagons and route vans.

The barriers prevent tools, testing equipment and other material from sliding forward to crush the seat and occupants in cases of sudden stops or if there is an accident. These safety barriers are constructed of a formed pipe frame, to which a sheet of expanded metal mesh is welded. Bolted securely to the frame of the vehicle, the barrier assembly is also braced with a heavy pipe anchored at the back of the car.

The cabinets are of a chest-like construction and are bolted to the floor. They are functionally designed to fit the needs of those who use the vehicle. Various designs were produced to accommodate the different makes and models of vehicles in use. All drawers are mounted on steel ball bearing drawer slides and are fastened, as are the doors, with positive catches which will not open from a heavy jar or a sudden halt of the vehicle.

In the four-door model, the back seat was removed and replaced with a cabinet the full width of the car. In the station wagon the drawers slide out at an angle just sufficient to be parallel to the vehicle's door when fully opened.



Condenser Plates Handled Safely With No Strain

*J. T. **CHILDRESS**, Working Foreman,*
*D. O. **WISSLER**, System Station Man,*
Appalachian Power Co, Roanoke, Va.
—AEP System

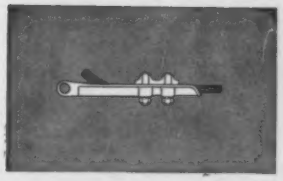
A simple mechanical lifting frame-support eliminates the clumsy and hazardous circumstances normally involved in handling 150-lb header plates covering the lower cooling tubes on the condensers at Appalachian Power Co. Originally two men man-handled the plates. The lifting aid now allows one man to safely and efficiently lower and raise the plates. One end of the "lifter" is supported on top of the manhole cover. The other end is a frame that fits around the plate housing.

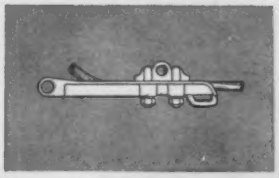
Above this, at the end of the boom, is an eyebolt, high enough to permit one man with a set of rope blocks to handle the plates.

BETHEA CLAMPS WITH A BUILT-IN SAFETY MARGIN

Millions of Bethea Clamps have been supplied to electric utilities in this country and abroad. All are designed, tested, produced and guaranteed to meet the most rigid industry requirements.

For example, Bethea straight dead end clamps offer unusual effectiveness and economy—for every application. From two U-bolt standard styles with superior holding power, to multi U-bolt "specials" for greased core conductors, all have been designed for easy installation and hot workability. Materials are 356-T6 aluminum alloy body and keeper, high strength steel hardware and stainless steel cotter pins.





A dead end for every general and special application—
Write for catalog and Pittsburgh Testing Laboratory Data.

QUALITY CABLE FITTINGS

1950 1960
10th YEAR OF SERVICE

A BETTER WAY FROM . . .

Bethea COMPANY, INC.

P. O. BOX 1407 — BIRMINGHAM, ALABAMA

CIRCLE 113 ON READER SERVICE CARD

TECHNICAL BRIEF NO. 60-2

By D. L. DAVIES, *Manager, Technical Dept.*
Wood Preserving Division
Koppers Company, Inc.

PRESERVATIVE PENETRATION IN SOUTHERN PINE POLES

Emphasis in the past has been placed on the importance of preservative retention in poles. Penetration is equally important. The data on which present AWPA penetration requirements are based are reviewed below.

INITIAL SPECIFICATIONS

In 1924, the American Wood-Preservers' Association adopted its first specification covering pressure treatment of poles. This specification required that "all of the sapwood and as much of the heartwood as practicable" be penetrated. The method for determining penetration was not clearly defined.

RELATIONSHIP BETWEEN PRESERVATIVE PENETRATION AND DECAY

In the early 1930's AWPA Committee 5-5-1, "Poles-Pressure-Treatment" began an extensive inspection of pole lines to determine whether there actually was any relationship between preservative penetration and decay. The investigation included a careful examination of 2,393 southern pine poles which had been in line ten years or less.

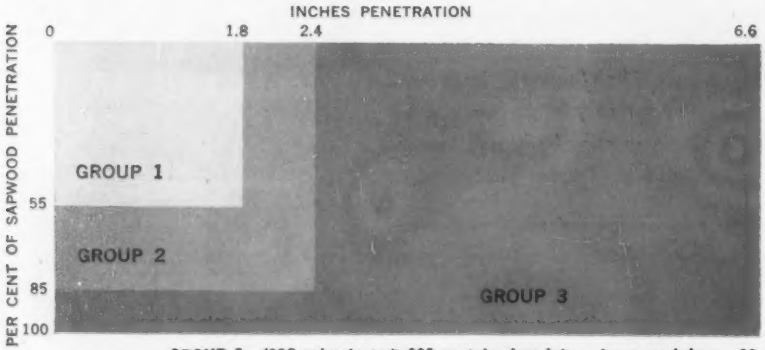
Sections of the chosen lines contained from 100 to 200 or more poles that had been set consecutively in a period of one year.

Each pole was tested by sounding with a hammer or a hatchet. When hammer blows produced a dull tone, the suspicious area was sampled with an increment borer, so that sapwood depth, penetration, and decay could be determined in that area. On all poles which proved sound, increment borer cores were taken 4½ feet above the ground line for measurement of sapwood depth and penetration.

TEST RESULTS

Table below shows that there were *no* failures in Southern Pine Poles with at least 2½ inches of penetration *or* 85% or more of the sapwood penetrated.

As a result of this study, the AWPA, in 1937, revised the standard for southern pine poles to require a minimum penetration of either 2½ inches or 85% of the sapwood.



GROUP 1—(286 poles tested) 223 contained no internal sapwood decay, 28 contained internal sapwood decay, but were serviceable and 35 failed due to internal sapwood decay.

GROUP 2—(324 poles tested) 318 contained no internal sapwood decay, 5 contained internal sapwood decay but were serviceable, and only 1 failed.

GROUP 3—(1783 poles tested) no internal sapwood decay.

KOPPERS
PRESSURE-TREATED WOOD

For the full report on Preservative Penetration in Southern Pine Poles, or answers to technical questions on poles or pole treatment, write: Koppers Company, Inc., Wood Preserving Division, Technical Department, Room 748, Koppers Building, Pittsburgh 19, Pa. C-46

Plant Winterizing

(Continued from p 107)

troller access door. Float-type control linkages can freeze up in the narrow confines of their mounting pipe flanges due to condensation. Strip heaters provide adequate protection.

• Pipe lines entering or leaving a building can freeze-up if the wall pipe sleeve is not properly plugged to avoid venturi action of the air. PSC is presently using ethylene glycol instead of air in short runs of capillary tubes to pressure switches. Diaphrams, small orifices or ball checks are used to prevent loss of the ethylene glycol and to separate it from the air.

In the application of electric heat to solve these problems we need to consider certain factors:

• What temperature should be established as a norm?

• What average ambient temperature should be the minimum?

• What other atmospheric conditions should be considered?

• What effect or benefit will heat produced by the media carried in pipes and tubing have upon our equations? Upon the winterizing materials? What effect will the combined heating of pipe media and winterizing materials have?

IN PSC plants, electric heat is applied whenever equipment cannot be made safe from freezing by location, circulation or drainage, or does not have freeze protection integral with its design. Electric heating is installed to maintain at least 35F at the surface of the pipe or vessel, assuming weather conditions of (—) 10F, and 10 mph wind. The surface referred to here is the metal surface inside the thermal insulation.

A series of discussions covering the various parameters entering into the determination of the size, type and quantity of electrical heating elements required to custom-winterize specific semi-outdoor plant equipment will be presented in subsequent issues of Electrical World's EUM section.

DEEP DEEP GROUNDING

INSURES EXTRA PROTECTION

• Heat treated, alloy steel driving stud resists mushrooming — can be used over and over. Couplings of rugged Silicon Bronze.
• Completely machined point speeds driving. All rod sections are threaded on both ends for use as top, intermediate or bottom section.
BLACKBURN Sectional COPPER BONDED GROUND RODS
Permanently Moist Soil

Blackburn Sectional Rods Get Down Into The Permanently Moist Soil

Drive down to permanently moist soil that gives lower earth to rod resistance. Actual experience shows a few dollars invested in deep grounding has saved thousands of dollars in overhead burn-outs.

- **BLACKBURN Sectional Rods have a uniform coating of highly conductive corrosion-resistant copper, molecularly bonded to *rigid steel core.***
- **Driving studs and couplings interchangeable with all standard sectional ground rods.**
- **Available through Electrical Distributors.**

JASPER BLACKBURN CORPORATION
1525 Woodson Rd., St. Louis 14, Mo.
WYdown 3-9430

CIRCLE 115 ON READER SERVICE CARD

EM MANUFACTURERS LITERATURE

To request literature, use code numbers indicated for each item when filling in Reader Service Card

COMMUNICATION

SIGNAL EQUIPMENT . . . audible, for almost every industrial need. Complete diagrams, specifications, and mounting methods for various types. Accessories listed. Bulletin K, 16 pages. Benjamin Division, Thomas Industries, Inc, Adv Dept, 207 E Broadway, Louisville, Ky. **(151)**

TWO-WAY RADIO . . . MOTRAC, transistorized. Operates with any 6 or 12-v system, positive or negative ground. Power output range up to 100 w in 25-50 mc band, up to 80 w in 150-174 mc band. Private-Line feature mutes receiver except when receiving properly coded transmission. Brochure, four pages. Motorola Communications & Electronics, Inc, 4501 Augusta Blvd, Chicago 51, Ill. **(152)**

DISTRIBUTION

BUS DUCT EQUIPMENT . . . application data for laying out, specifying and installing. Descriptions, drawings, dimensions, specifications, and test data. Designed to carry excitation currents, also for battery charging and electroplating. Application data No. 30-664, 10 pages. Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa. **(153)**

CIRCUIT BREAKER . . . and load center line, MP, guaranteed-for-life line. Detailed catalog listings, photographs, and wiring diagrams. Breaker capacity for single, double, duplex, and 3-pole breakers in enclosures. New duplex circuit breaker and 200-amp breaker also described. Bulletin MP60, eight pages. Murray Mfg Corp, 1250 Atlantic Ave, Brooklyn 16, N. Y. **(154)**

SWITCH . . . vertical-break, MK-40, air, 400 to 4,000 amp, 7.5 to 400 kv, with only three moving parts. Links, levers, and braids eliminated. Illustrations of six arc interrupters. Bulletin, four pages. Delta-Star Electric Div, H. K. Porter Co, Inc, Chicago, Ill. **(155)**

SWITCH & FUSE EQUIPMENT . . . rollout, for 2.4 to 13.8-kv power systems requiring light-duty switching. Maximum short-circuit protection provided by three current-limiting fuses on source side of load-break switch. Bulletin GEA-6623B, eight pages. General Electric Co, Schenectady 5, N. Y. **(156)**

CIRCUIT RECLOSERS . . . oil, automatic. Application guide. Report on scope, ratings, application, operation, and maintenance prepared by Transmission and Distribution Committee of Edison Electric Institute. Publication No. 60-52, 60¢. EEI, 750 Third Ave, NYC 17. **(157)**

GROOVE CLAMPS . . . aluminum, center-bolt, parallel, PAC Series and PAA Series. Used for variety of aluminum to aluminum and aluminum to copper connections such as service and equipment taps and service entrance. Data Folder No. 6007, four pages. Jasper Blackburn Corp, 1525 Woodson Rd, St. Louis 14, Mo. **(158)**

PLASTIC TUBING & MOLDING . . . tubing for protection of wires, strands and conductors. Includes rigid (vinyl) and flexible (polyethylene) tubings for protecting distribution transformer primaries from cutouts to bushings; secondary runs from bushings to taps; and eight other uses. Catalog Section TU, two pages. Also line of Kover-Gard moldings for protection of surface-mounted conductors and cables. Catalog Section KG, two pages. Fanner Mfg Co, Brookside Park, Cleveland 9, Ohio. **(159)**

INSTRUMENTS

CONTROL CABINETS . . . standard cabinets for electric control systems, METROTYPE information systems, and analog computing equipment. Details of construction, wiring, and dimensions. Product specification G71-6, two pages. Bailey Meter Co, 1050 Ivanhoe Rd, Cleveland 10, Ohio. **(160)**

PORTABLE LOAD BOXES . . . standard ratings 0.1 through 5 kva, ac adjustable power supplies, for field and laboratory use, Multi-Amp Universal. Basically a low-voltage, high-current transformer load or adjustable power supply. Booklet SB-LB-1, eight pages. Multi-Amp Div, Multi-Amp Electronic Corp, 465 Lehigh Ave, Union, N. J. **(161)**

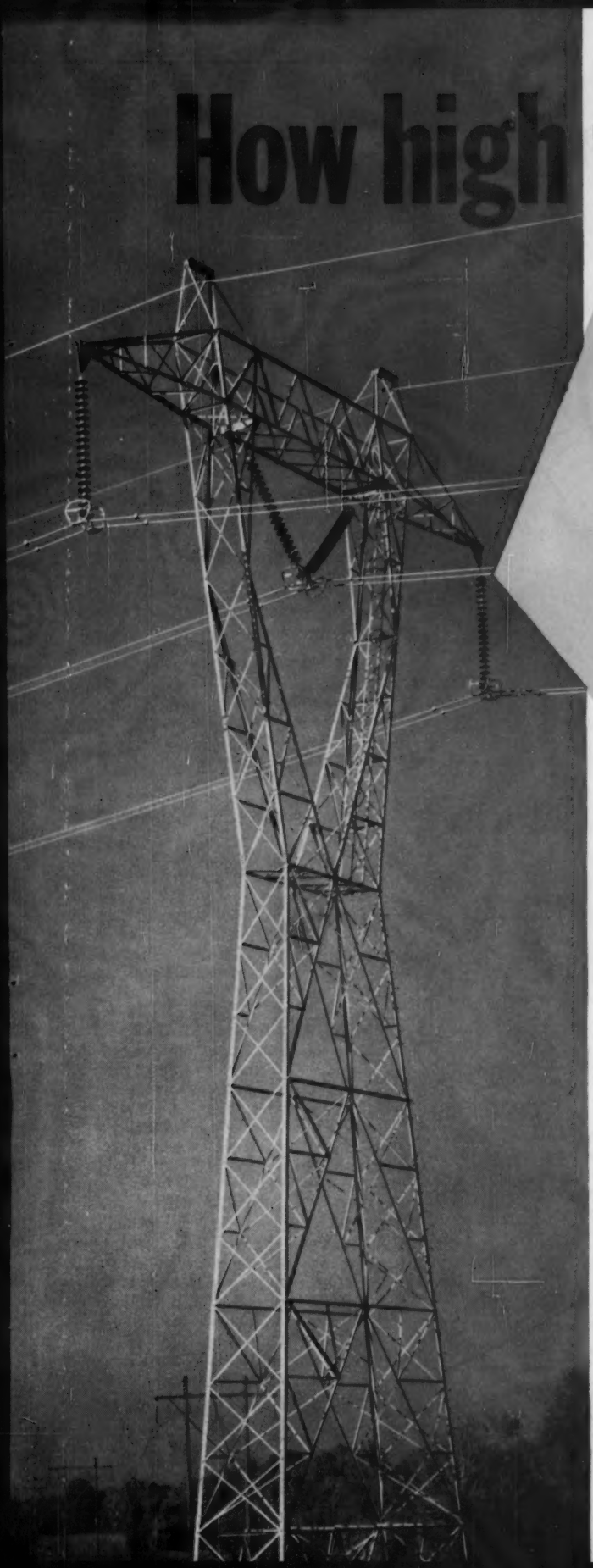
INSULATION TESTING . . . methods and instruments for high-voltage breakdown testing of insulating materials, including determining resistance to arcing of such materials and detection of corona leakage. Manual G-65, 40 pages. Associated Research, Inc, 3777 W Belmont Ave, Chicago 18, Ill. **(162)**

FLOW METERS . . . for measuring liquid and gas, at line conditions, using vortex-velocity principle, the Rotron Whirl-Flo meter. Operation based upon coupling rotary and linear flows. Combined with densitometer or ElectroniK instruments, measures mass flow. Catalog C295-1, eight pages and instrument Data Sheet 10.3-9, four pages. Minneapolis-Honeywell Regulator Co, Wayne & Windrim Aves, Philadelphia 44, Pa. **(163)**

INSULATION

PLASTICS . . . sheets, rods, tubes, films, blocks and flat tubings for 14 plastic families. Available sizes, weights, color ranges, textures, purchasing specifications, grades and prices. Revised and expanded comparison table of chemical, electrical and mechanical properties. Catalog, 64 pages. Cadillac Plastic & Chemical Co, 15111 Second Ave, Detroit 3, Mich. **(164)**

(More Literature on page 118)



How high tomorrow?

O-B insulators and hardware are ready now for tomorrow's EHV

Our broad experience on EHV test lines, on EHV operating lines, and on our own EHV research programs indicates that O-B insulator and hardware designs need place no upper limit on transmission voltages.

The designs you'll need tomorrow, in other words, are quite possibly the same O-B designs you're using right now!

No other insulator and hardware manufacturer offers greater breadth or depth of experience with Extra-High Voltage transmission.

No other offers the "look-ahead" benefits you get today in O-B insulators and hardware!

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co. Ltd., Niagara Falls, Ont.

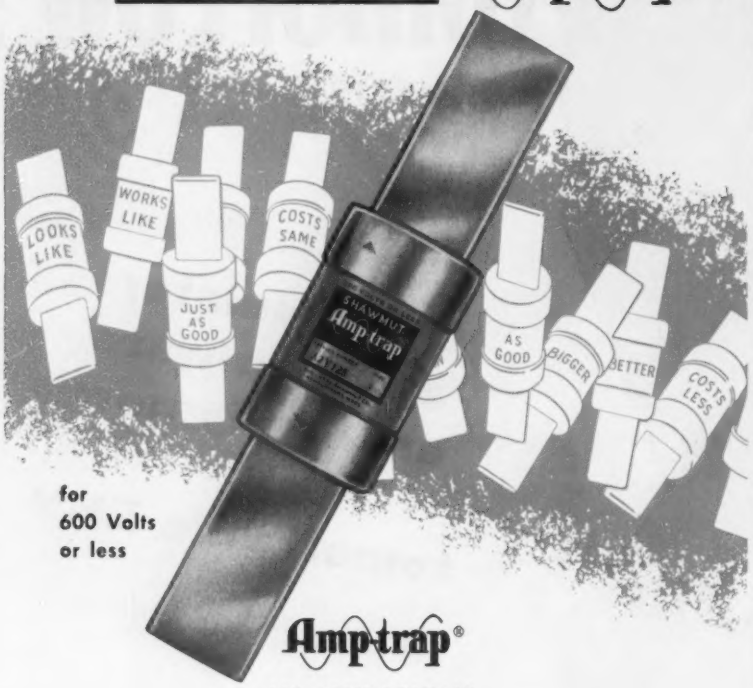
Ohio Brass (B) HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

10026-H

CIRCLE 117 ON READER SERVICE CARD

HOW GOOD IS... AN IMITATION Amp-trap®?



for 600 Volts or less

Amp-trap®

VS IMITATIONS

Amp-traps are *our* products. We originated and developed them. We alone manufacture them. They are so good that others are now imitating them. This is flattering because it indicates Amp-trap is superior. But, don't be confused by imitations.

Amp-trap®

VS SUBSTITUTES

"Just like Amp-trap." "As good as Amp-trap." "Works like Amp-trap." "Better than Amp-trap." These are the deceptive phrases that imitators must use. Without them they can neither explain nor sell their substitutes.

NOTHING TAKES THE PLACE OF

Amp-trap®

Whenever you *need* Amp-trap, you *want* Amp-trap — not an imitation or a substitute. Amp-trap is a very special current limiting device with high interrupting capacity. Regardless of claims, imitations aren't enough. More than 27 patents prove it. *Nothing takes the place of Amp-trap!* For your own protection specify Amp-trap. Then — make sure you get it.

Amp-trap® – Awake At The Switch

REGISTERED UNITED STATES PATENT OFFICE Est. 1893

THE CHASE-SHAWMUT CO.
374 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS
Subsidiary of I-T-E CIRCUIT BREAKER CO.

More Literature

(Continued from page 116)

INSULATING TAPE . . . CDF, Level-Wrap silicone rubber, self-adhering with triangular cross section which makes completely level exterior wrapping possible. Bulletin No. 18,110, two pages. Continental-Diamond Fibre Corp, Newark, Del. **(165)**

SILICONE RUBBER . . . Silastic brand, for wire and cable insulation. Data charts and graphs, photos on applications. Folders, six pages. Dow Corning Corp, Midland, Mich. **(166)**

TAPES . . . TEMP-R-TAPE selections in pressure-sensitive Teflon, fiberglass and silicone-rubber tapes. Data and properties on ten high-temperature tapes, analyses of each. Brochure, four pages. Connecticut Hard Rubber Co, Dept TRT, New Haven, Conn. **(167)**

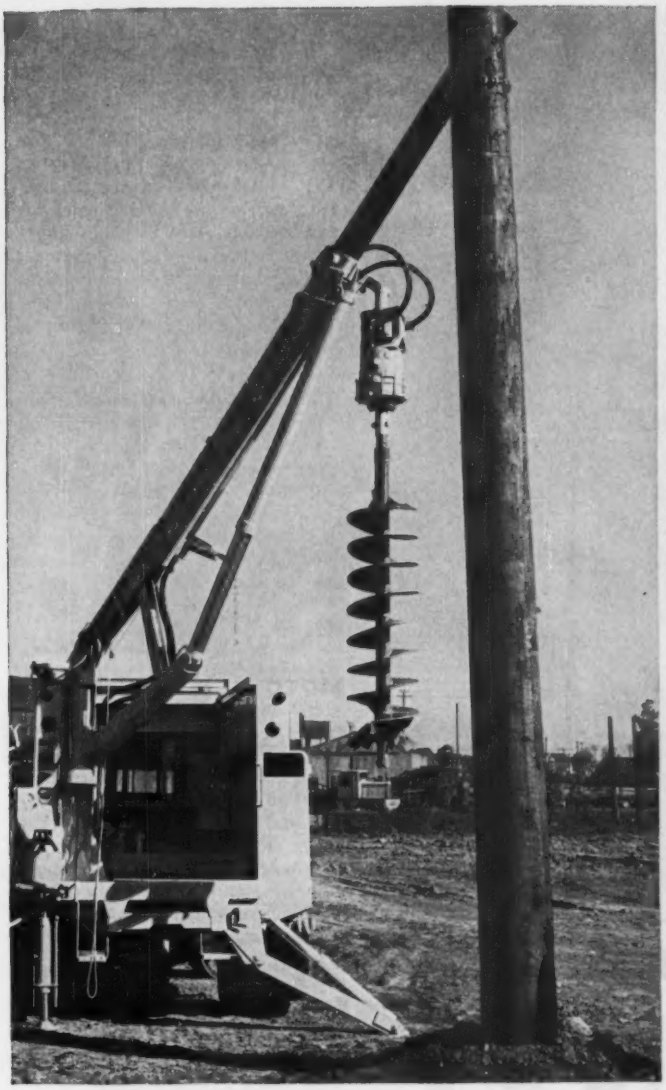
LIGHTING

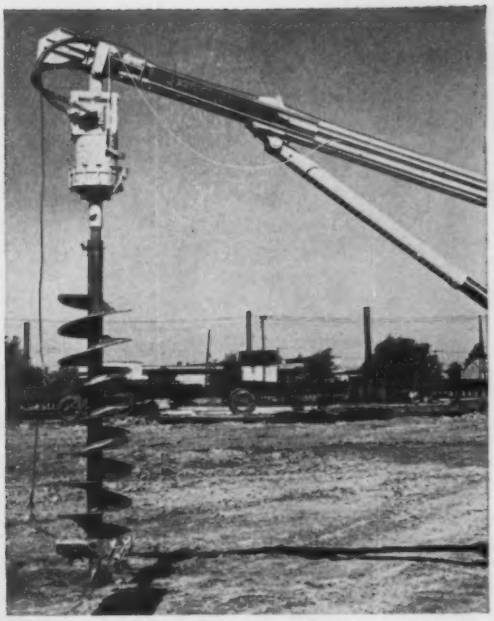
LUMINAIRES . . . for street and highway lighting. Report of joint committee of Edison Electric Institute and National Electrical Mfrs Assn on standardization of street lighting equipment. Available from American Standards Assn, Inc, 10 E 40 St, NYC 16 and American Institute of Electrical Engineers, 29 West 39 St, NYC. **(168)**

MERCURY-LAMP BALLASTS . . . standard indoor and special-purpose, weatherpoof and high temperature units covered in selection and application data, wiring diagrams. Specifier's guide, Bulletin GEA-7056. General Electric Co, Schenectady 5, N. Y. **(169)**

LIGHTING HANDBOOK . . . on modern lighting practices includes section on newest light sources, data on coefficients of utilization and maintenance factors, foot-candle tables, and application illustrations. Pocket-sized with wire-o binding. Handbook, 250 pages, $3.00, prepaid. Westinghouse Electric Corp, Lamp Division, Bloomfield, N. Y. **(170)**

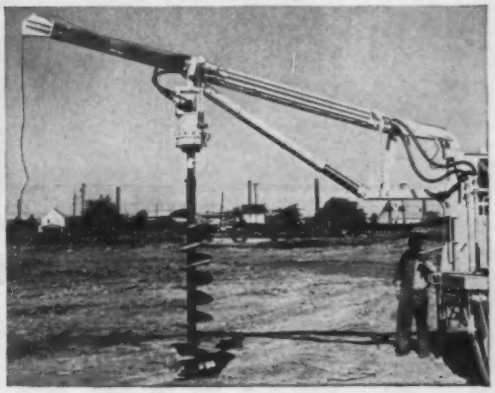
(More Literature on page 120)





Semi-automatic device locks borer on end of extendible boom for digging.

Borer automatically locks to end of main boom when retracted, leaving extendible boom free for pole setting.



Diagnosis: High Feed Pressure

Strongest corner-mounted derrick in the field is Holan's 7500 — a powerful, time-saving derrick that operates in an arc behind and to the right side of the truck.

Here's power . . . real power . . . all the up and down feed pressure needed to drive any derrick-suspended digger. And more than that, it's the only corner-mounted derrick built capable of handling Holan's rugged 3-speed 5400 Earth Borer.

Jobs can go ahead on schedule — even in alleys, narrow streets and congested areas because positioning problems are ended. Parked parallel to the curb, the 7500 swings over . . . even over fences and guard rails . . . reaches out . . . and digs deep holes, sets poles up to 70 feet in length.

The 7500 is engineered as a complete unit to avoid body and derrick stresses . . . can "live boom" 8,500 pounds, winch 10,000 pounds.

A semi-automatic locking device moves the earth borer onto the extendible boom for digging . . . or to its main boom storage position.

The 7500 . . . shown here mounted on the left side . . . is available mounted on the right side. It reaches up 27'-6", 18½' behind the truck, and beyond the right side 12'-3" (left-side mount) and 16'-10" (right-side mount) with boom extended.

Before you buy any corner-mounted derrick, write us — or call your Holan Field Representative — for complete details.

Holan Corporation, 4100 West 150th Street, Cleveland 35, Ohio
Plants in: Cleveland, Ohio; Griffin, Georgia; Phoenix, Arizona

Holan

Subsidiary of THE OHIO BRASS COMPANY

HOLAN

LUMATROL® MARK I !

If highest reliability at lowest cost is your most important requirement in automatic street light control... *this is the baby that will do the job!*

Write for Complete Specifications
MICRO BALANCING, INC., Garden City Park, New York
In Canada: J. R. Kearney Corp., Box 270, Guelph, Ontario

More Literature

(Continued from page 118)

MERCURY LUMINAIRE . . . for residential street lighting, M-250R. Description of new refractor lens design. Lighting layouts with application data and ordering information. Photos include cutaway view of luminaire, applications and dimension drawings. Bulletin GEA-7210, ten pages. General Electric Co, Schenectady 5, N. Y. **(171)**

MECHANICAL LADDER . . . HDG Laddermount, truck-mounted ladder used for working on street lights and other high installations. Photos of main features, dimensional drawings keyed to ordering chart. Bulletin, four pages. H. K. Porter Co, Inc, Delta-Star Electric Div, Chicago, Ill. **(172)**

MOTORS & CONTROLS

ELECTRIC MOTOR CONTROL . . . operation and maintenance. Data on large ac motor application and servicing detailed. Text giving step-by-step information on all phases is illustrated to show processes, paths of flow, mountings, characteristics and components of various motor types. Synchronizer, Special issue 200-SYN-55, 34 pages. Electric Machinery Mfg Co, Minneapolis 13, Minn. **(173)**

MOTOR STARTERS . . . for fractional-hp and integral-hp motors to 7½ hp, manual, CR101 and CR1062. CR101 is available in single or double-pole forms, 115 to 230 v, 1 hp maximum; CR1062 is designed for single-phase application to 5 hp; polyphase to 7½ hp; 110 to 600 v; and dc motors to 2 hp, 115 to 230 v. Bulletin GEA-6358C, 12 pages. General Electric Co, Schenectady 5, N. Y. **(174)**

REDUCED-VOLTAGE STARTERS . . . autotransformer, manual and magnetic, primary resistor, part winding and wye delta. Selection and comparison table on all types. Typical wiring diagrams and listing of kits and enclosures. Bulletin GEA-6860A, eight pages. General Electric Co, Schenectady 5, N. Y. **(175)**

(More Literature on page 122)

100% inspection of MegopaK thermocouples insures strict adherence to factory standards. Manufacturing area is clean, dry, air-conditioned.

Get real economy in mineral-insulated thermocouples . . . specify quality-controlled *MegopaK*

Careful quality control often spells the difference between *real* economy and just another bargain. In small-diameter, mineral-insulated thermocouples, where the art of production is as critical as the science, strict quality control is your only assurance of consistent quality and real economy.

For more information on quality-controlled *MegopaK*, write for Catalog and Price List G100-4 . . . or call your nearest Honeywell field engineer.

Honeywell

First in Control

SINCE 1885

75th YEAR — PIONEERING THE FUTURE

Insulators are stored in paraffin-sealed boxes, then baked to remove last trace of moisture. Assemblers wear gloves to prevent contamination of thermocouples.

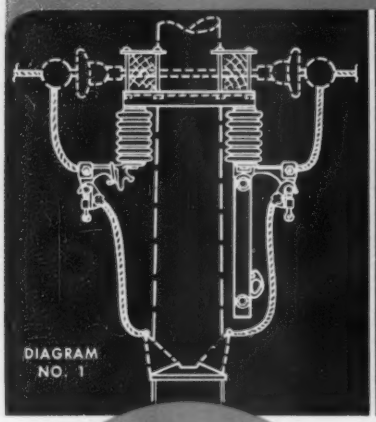
Single-pass swaging of carefully-sized wire-insulator-sheath assembly produces no distortion in wire, insures greater accuracy and longer life.

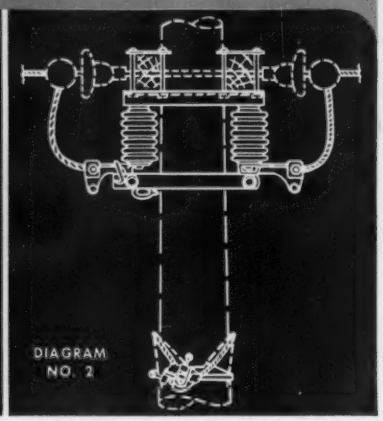
Continuous hydrogen-annealing not only produces a ductile, brightly finished product, but also identifies improperly compacted material which is rejected during inspection.

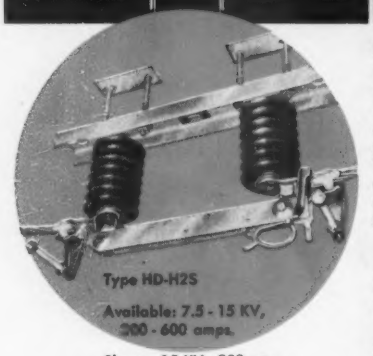
NOW BY-PASS LINE RECLOSERS SAFELY—ECONOMICALLY!

USCO TYPE HD-H2S

recloser BY-PASS switch







Shown: 15 KV—200 amp.

Also available with removable blade (HD-RB).

PAT. PENDING.

DIAGRAM No. 1

In this typical single-phase installation, the HD-H2S blade is open and the recloser is in service. Notice that the recloser leads are connected with hot-line clamps to special studs which are part of the switch itself. This permits the use of shorter, safer recloser leads and, of course, eliminates the need of hot-line clamps on the all-important main-line conductor.

DIAGRAM No. 2

Here you see the recloser by-passed. One lineman has closed the blade, tripped "open" the recloser and removed the hot-line clamps—lowering *both* clamps with his "hot stick" at the same time. The HD-H2S contributed materially to the lineman's safety! Rated at 20,000 amperes momentary, the HD-H2S BY-PASS switch assures service continuity during the inspection of line reclosers, primary metering, etc.

The HD-H2S is already serving in the best interests of safety, economy and operating efficiency on the systems of scores of operating utilities. There are applications for the HD-H2S BY-PASS switch on your system too. We suggest you try three HD-H2S BY-PASS switches for trial installation.

USCO

USCO Power Equipment Corp.

829 North 36th Way, Birmingham 4, Alabama • LYric 2-7241

Designers and Manufacturers of High Quality High Voltage Equipment

More Literature

(Continued from page 120)

INDUCTION MOTORS . . . Tri-Clad '55, single and 3-phase, ¾ to 150 hp. Application chart for types for various loads and ambient conditions, tables on dimensions, prices, performance data. Bulletin No. GEC-1049, 14 pages. General Electric Co, Schenectady 5, N. Y. **(176)**

MULTI-SHIELDED MOTORS . . . STERLICON, ac, drip-proof, ¼ to 200 hp. Data on modifications such as specialized mountings and enclosures. Complete pricing and dimensional information. Special section on motor selection and application. Catalog No. 200, 276 pages. Sterling Electric Motors, Inc, 5401 Telegraph Rd, Los Angeles 22, Calif. **(177)**

ELECTRIC MOTORS . . . fractional and integral hp motors. Data for designing, selecting and specifying for those requiring special motor designs. "Idea book," Condensed Motor Data and Price Bulletin 150, 12 pages. Doerr Electric Corp, 100 N Fourth Ave, Cedarburg, Wis. **(178)**

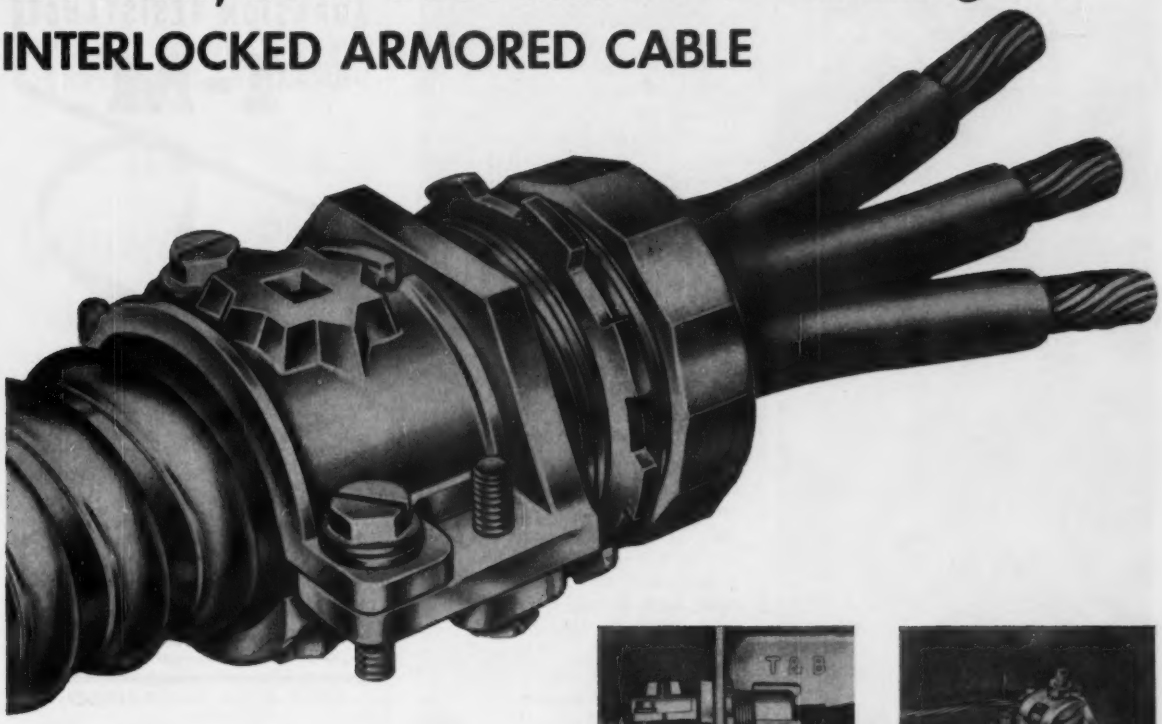
POWER PLANTS

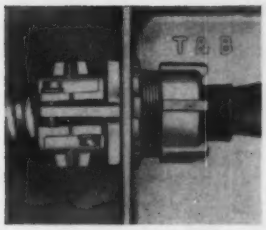
GAS TURBINE . . . 9,000-hp, single-shaft. Characteristics of design featuring single compressor-turbine rotor supported in two bearings discussed. Photos, block and schematic drawings of both liquid and gaseous fuel systems. Entire unit including combustion system contained in common casing. Bulletin 198, 12 pages. Clark Bros Co, Olean, N. Y. **(179)**

GENERATOR SETS . . . for standby and continuous off-the-line power, 13.5 to 260 kw. Radiator-cooled and heat-exchanger-cooled sets; engine data for Series 53, 71, and 110, including twins, V engines, in-line models. Brochure, Form 8SA68, eight pages. GM Diesel, Detroit Diesel Engine Div, Adv Dept, Detroit 28, Mich. **(180)**

(More Literature on page 124)

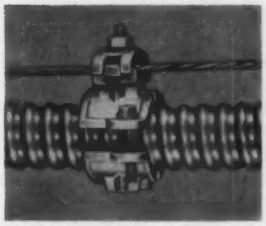
see NEW, LOW COST method of installing INTERLOCKED ARMORED CABLE



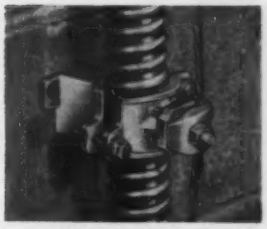


FOR WET LOCATIONS

FOR GROUNDING



FOR HORIZONTAL SUPPORTING



FOR VERTICAL SUPPORTING

See this single fitting system that eliminates on-the-job improvising . . . installs with all sizes of Interlocked Armored Cable . . . eliminates costly racks, ladders, baskets and trays. The simplified fitting design will give you unusual savings in meeting these installation requirements:

● TERMINATE ● GROUND ● DEAD-END
● POT HEAD ● SUPPORT ● MOUNT ● SPLICE
● IN WET OR DRY LOCATIONS

OTHER ADVANTAGES:

Fewer fittings required to accommodate the full range of cable sizes . . . fewer items to stock.

All T&B products available only through authorized T&B distributors

For complete details, with case histories on how these new T&B fittings have solved the problems of others, fill out and return the coupon below.

The Thomas & Betts Co., Inc., 31 Butler St., Elizabeth 1, N. J.

Please include my name for your "Eyeopener" series about T&B Interlocked Armored Cable Fittings.

My name _____

Title _____

Company name _____

Street _____

City & State _____

B

THE THOMAS & BETTS CO.
INCORPORATED

T&B ENGINEERED

ELIZABETH, NEW JERSEY
IN CANADA, THOMAS & BETTS, LTD. MONTREAL

A TREE TRIMMING PROBLEM SOLVED

By spinning this three conductor cable . . . .

The utility company that installed the distribution line in this photo had permission to go through this forest of great old evergreens, if they did not cut, trim, or damage the trees. After investigating all types of line construction they found that field spun cable was the best solution to their problem. Using cable and spinning it in the field, they were able to put up this three conductor distribution line to everyone's satisfaction, *at a cost less than any other type construction.* For information on field spun cable, write to address below.

CABLE SPINNING EQUIPMENT CO.

3100 Topeka Avenue Topeka, Kansas

More Literature

(Continued from page 122)

PLANT EQUIPMENT . . . standard reciprocating, axial-flow and centrifugal air compressors, centrifugal pumps, steam condensers, steam-jet ejectors, vacuum pumps, air hoists, air and electric tools. Size and capacity ranges, recommended applications. Form 223, eight pages. Ingersoll-Rand Co, 11 Broadway, NYC 4. **(181)**

GAS TURBINE . . . RT-248, 10,500-hp, jet-driven. Thermal efficiencies, maintenance costs, and potential applications discussed. Brochure, No. 95, eight pages. Cooper-Bessemer Corp, Mount Vernon, Ohio. **(182)**

MECHANICAL DRIVE TURBINES . . . single stage, types DP and DR, for pumps, compressors, fans, blowers. Ratings up to 1,500 hp, speeds 1,000 to 6,500 rpm. Special features include balanced-taper valve providing reliable speed control; totally-enclosed, oil-relayed governor; pressure-lubricated bearings. Bulletin GEA-4955C, 16 pages. General Electric Co, Schenectady 5, N. Y. **(183)**

RIGID CONDUIT . . . aluminum, in complete range of standard trade sizes, also elbow and couplings, including 5 and 6-in. sizes. Dimensions and weights specified, with recommended installation procedures. Brochure. Harvey Aluminum, 19200 S Western Ave, Torrance, Calif. **(184)**

THERMAL INSULATION . . . economic approach to specification, enabling determination of point at which insulation gives greatest financial return for its cost. Detailed descriptions and characteristics. Section on economic thickness. Index to ASTM and government specifications. "Rethinking Thermal Insulation," 18 pages. National Insulation Mfg Assn, 441 Lexington Ave, NYC 17. **(185)**

STORES & SHOPS

WELDING . . . recommended practices for gas shielded-arc weld-

(Continued on page 128)

greater

STRENGTH
FLEXIBILITY
ABRASION RESISTANCE

with **I-M**

the RED CENTER *linesmen's safety strap*

a product of

ATLAS

SAFETY EQUIPMENT CO., INC.

173-179 North 10th Street • Brooklyn 11, N.Y.

For complete catalog on linemen safety belts, straps and harnesses write today.

CIRCLE 49 ON READER SERVICE CARD

BIDDLE INSTRUMENTS

DIELECTRIC TEST EQUIPMENT

40 KV Model is a one-man portable set for maintenance d-c tests. Maximum safety built in. Simple operation. Reliable performance. You get excellent output voltage with facilities for voltage and leakage current measurements.

Also available: model for operation up to 100 KV and another for operation to 5 KV. Useful for development work to test d-c dielectric strength of insulating materials and adequacy of design of insulation in equipment; also in production tests for non-destructively detecting defects in electrical insulation.

Write for BULLETIN 22-W.

81008

BIDDLE INSTRUMENTS

JAMES G. BIDDLE CO.

Electrical and Speed Measuring Equipment

1316 Arch Street, Philadelphia 7, Pa.

CIRCLE 50 ON READER SERVICE CARD

TALL TOWERS to cross the Delaware River

Philadelphia Electric spans 4,200-ft river; towers meet navigational restrictions

The safety of river and air navigation had a great deal to do with the final design of Philadelphia Electric Company's aerial transmission crossing of the Delaware River a few miles south of the city. River traffic required a minimum conductor clearance of 210 ft above the ship channel, meaning the suspension towers had to be *tall*. On the other hand, it was necessary to limit the total elevation to 350 ft because of the proximity of Philadelphia International Airport.

TOWER DESIGN . . . The crossing towers, as designed jointly by P.E. and Bethlehem, consist of two massive suspension towers, located on man-made "islands," and two 150-ft-high anchor towers on shore. They provide a main span measuring 2,754 ft, and side-spans of 1,730 ft and 1,100 ft. The suspension towers rise 332 ft above their foundations, keeping the tower top below the limit of 350 ft. Designed to withstand unusually severe wind loadings—up to 45 pounds per sq ft — they were fabricated at our Leetsdale, Pa., shop, largely of Medium-Manganese Steel meeting ASTM 440-59T.

The anchor towers on shore were designed to bear the full brunt of the high tensions in the conductors, while the taller suspension towers are planned so that they will withstand the forces of high winds, rough waters and, if necessary, the hazard of watercraft collision.

While designed for ultimate operation at 220 kv, the line will be operated initially at 132 kv.

The two big towers required exceptionally heavy footings. This assembly, 2½ ft high, includes steel beams up to 27 WF 145 on a two-in.-thick baseplate. It's anchored by 1¾-and 2-in.-diam bolts more than 10 ft long extending deep into concrete piers.

IMPORTANT INTERCONNECTION... When put into service the line will provide an additional outlet for the new Eddystone electric generating station, on the Delaware River near Philadelphia. It will also increase service reliability, and provide an important link in the interconnection system with neighboring New Jersey utilities.

NEED TOWERS — SUBSTATIONS? There's never been a better time than now to order towers and substation steel. We can offer good delivery out of our Leetsdale, South San Francisco, and Seattle shops. Give us a call, won't you? There's a Bethlehem office near you.

Steel *for Strength . . . Economy . . . Versatility*

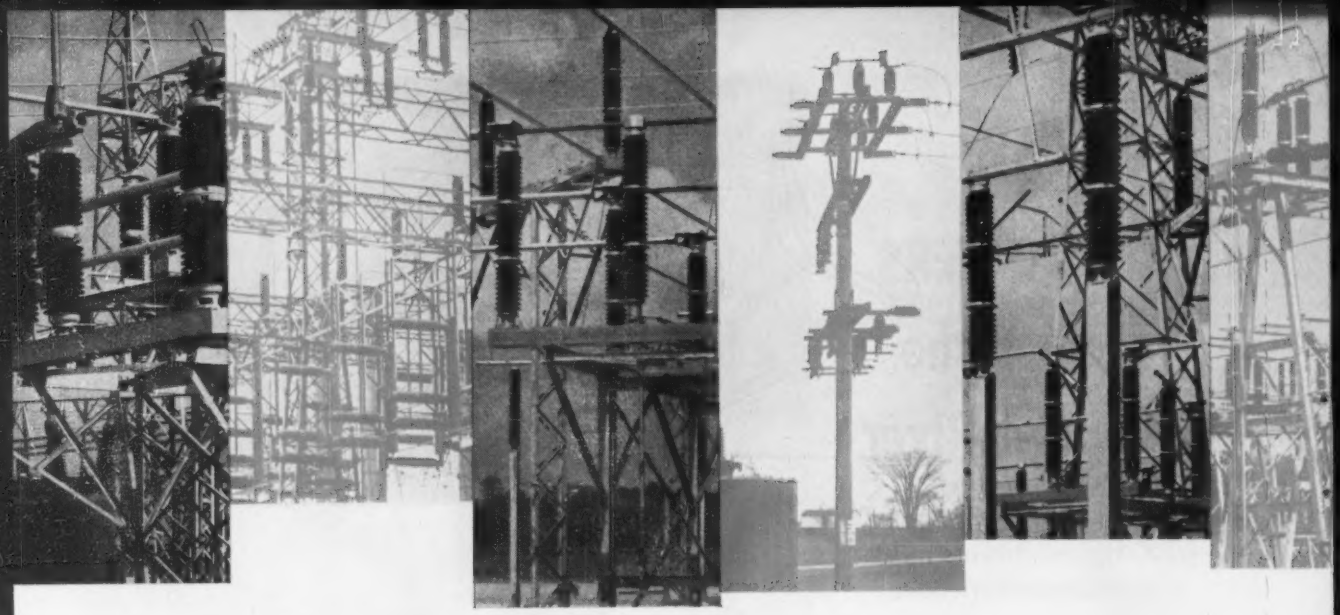
BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

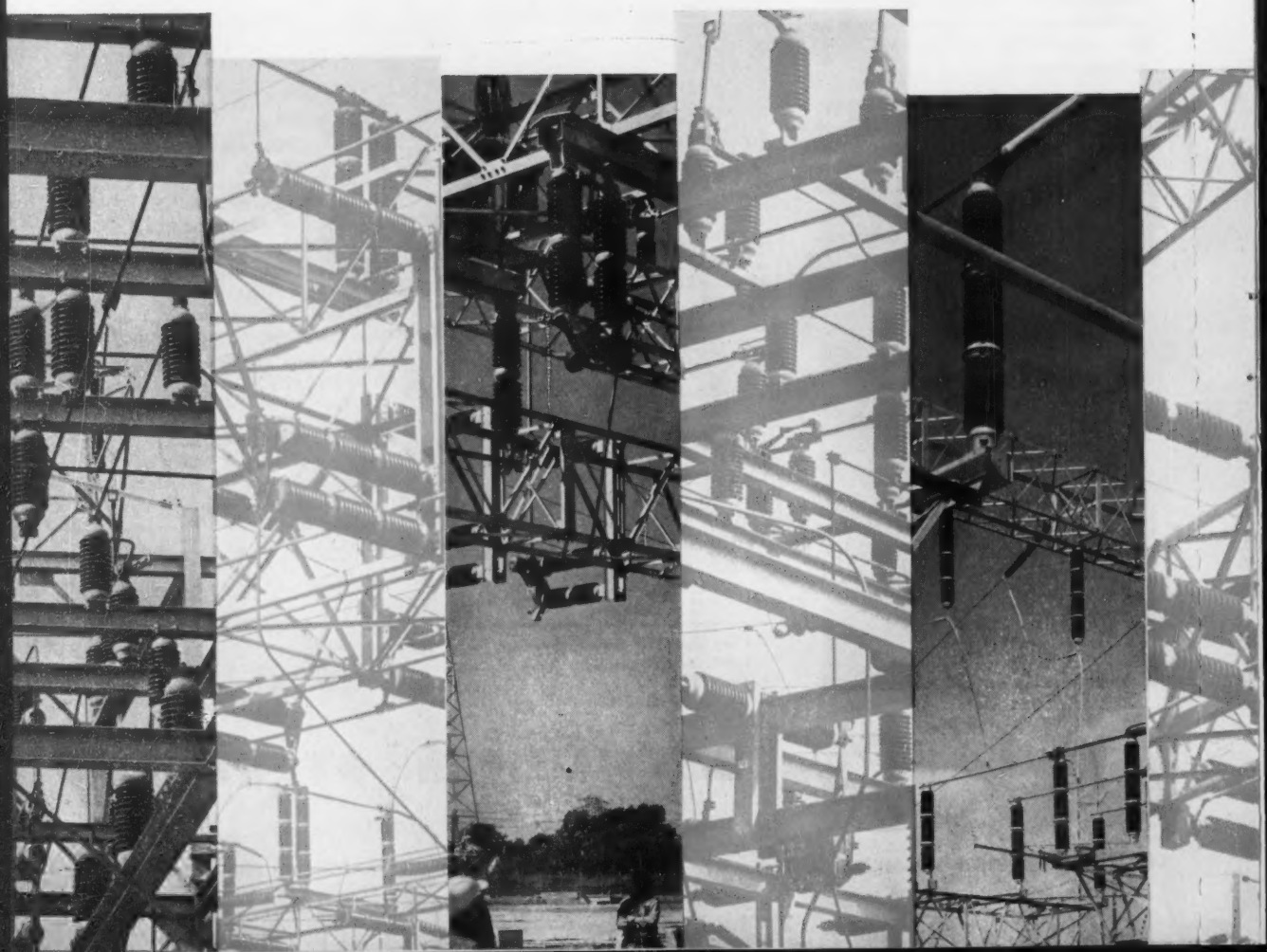
Export Sales: Bethlehem Steel Export Corporation

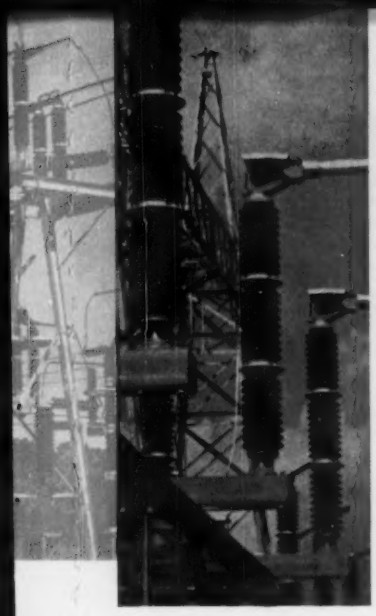
BETHLEHEM STEEL

CIRCLE 125 ON READER SERVICE CARD



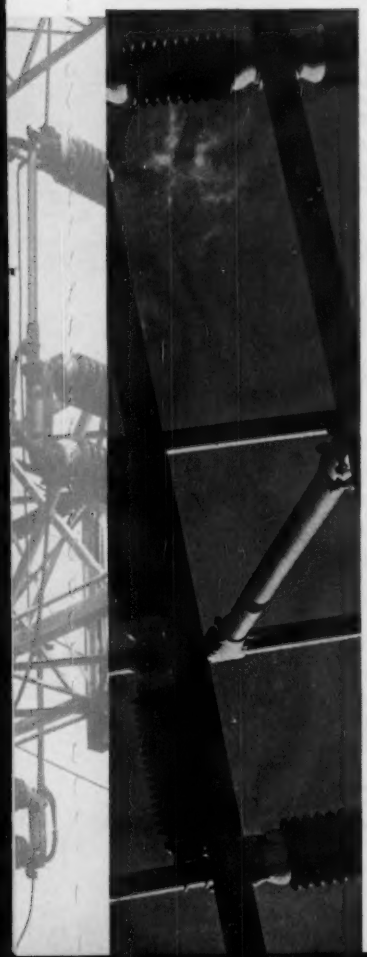
When you design with Lapp Station Posts....





Voltage Rating kv	BIL, kv	Cantilever Strengths, lbs.		
7.5	95	2,000	4,000	8,000
15	110	2,000	4,000	8,000
23	150	2,000	4,000	8,000
34.5	200	2,000	4,000	8,000
46	250	2,000	4,000	8,000
69	350	1,500	4,000	6,000
115	550	1,700	2,900	4,000
138	650	1,450	2,450	3,900
161	750	1,200	2,000	3,500
	900	910	1,450	2,750
	1050	750	1,170	2,300
	1300		1,000	2,000
	1470		900	1,750
	1640		770	1,550
	1800		680	1,400

.....you can have what you want in BIL, in strength, in stiffness



Use of Lapp Station Posts frees designers of modern substations from the need to design around characteristics—and shortcomings—of conventional switch and bus insulators.

The family of Lapp Station Posts is a "modular series" which gives widest range of insulation levels *and* strength ratings. Station Posts are smaller in diameter, too . . . lighter in weight . . . stiffer . . . easier to assemble; and they're suited to mounting horizontally, underhung or angled . . . available in strengths greater than have ever been offered in conventional pin-cap units.

Stations on Lapp Station Posts require less real estate, less steel work. And, because their performance is better under all electrical conditions and mechanical loading, they need less maintenance too. You should have the whole story. You can read it in the new Lapp Catalog No. 8. If you haven't a copy, we'll be glad to send one.

Lapp Insulator Co., Inc., LeRoy, N. Y.

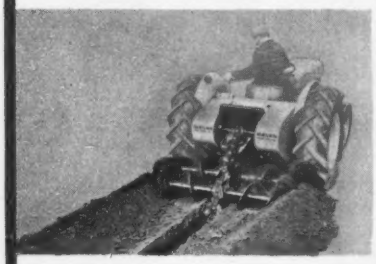
Lapp

CIRCLE 127 ON READER SERVICE CARD

WHY IS
AUBURN
THE
QUALITY TRENCHER?

Where it's manufactured?
Auburn Machine Works, Inc., established 1928, long known as the "House of Trenchers" is justly proud of its modern, precision equipped manufacturing facilities. Equipment that assures "Quality Controlled" production.

How it's manufactured?
AUBURN's skilled craftsmen have a pride of workmanship that comes with years of experience, training, and study in the manufacturing of trenching equipment. Their expertness in the operation of precision machine tools and their thorough mastery of the measuring and testing devices used throughout each stage of production, is your guarantee of the quality of the AUBURN.



Job proven . . Simple in design the Auburn Trencher is a perfect example of quality and ruggedness. It digs up to 800 ft. per hour—trenches 6" to 14" wide and down to 6 ft. deep.

Auburn owners, all over the world, have proven that quality means dependable performance and the most economical operation on all types of jobs.

AUBURN
MACHINE WORKS, INC.
2025 South J Street, Auburn, Nebraska, U.S.A.

Please send complete information and name of nearest dealer.

*Name*_____

*Address*_____

*City*_____ *State*_____

More Literature

(Continued from page 124)

ing of aluminum and aluminum alloy pipe. From processes and machine settings to welding techniques and heat treatment. Conversion table with ASTM alloy designations and corresponding commercial alloy number. Also table for recommendations of filler metals used for welding various combinations of aluminum alloys, table for settings for sizes and thickness of appropriate for size of pipe used. Booklet, 40 pages, $2.00 prepaid. American Welding Society, Dept T, 33 W 39 St, NYC 18. **(186)**

HOT-DIP GALVANIZING . . . guidebook on quality control of hot-dip galvanized controls. Practices of good galvanizing compared with poor galvanizing practices by technical committee to improve quality of work. ASTM specifications. Guidebook, pocket size, 40 pages, $1.00. Midwest Job Galvanizers Assn, Inc, Box 72, Chicago 50, Ill. **(187)**

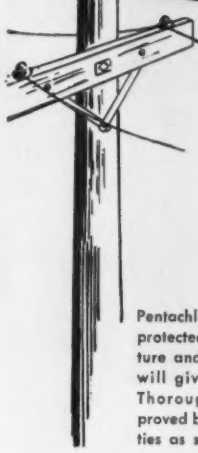
ALUMINUM PAINTS . . . ALUMINOX, five ready-mixed bright aluminum paints, each designed for specific purpose. Also heat resistant for interior and exterior surfaces from 400 to 1,100F. Technical Bulletin No. 5, two pages. Subox, Inc, Hackensack, N. J. **(188)**

CLEANING TOOL . . . Super Booster hydraulic jet cleaner, uses steam as energy source in venturi injector assembly combining it with water and detergent under high pressure. For equipment, machinery, walls, and floors. Bulletin 446, four pages. Sellers Injector Corp, 1600 Hamilton St, Philadelphia 30, Pa. **(189)**

CALCIUM SILICATE . . . pipe and block insulation, for up to 1,350F. Tables on transmission data, physical and thermal characteristics, standard sizes and recommended thicknesses. Folder, Form 6472, six pages. Philip Carey Mfg Co, 320 S Wayne Ave, Cincinnati 15, Ohio. **(190)**

(More Literature on page 129)

Haley's



CEDAR POLES • FIR CROSS ARMS

Pentachlorophenol Treated—protected against decay, moisture and insect damage, and will give long service life. Thoroughly tested and approved by leading public utilities as standard construction.

• Two strategically located yards
MINNEAPOLIS, MINNESOTA — FINDLAY, OHIO

R. G. HALEY & CO.
Spitzer Building
Toledo 4, Ohio

CIRCLE 51 ON READER SERVICE CARD

Whether a Winch Line Hook or a complete Line Body check your requirements with

UTILITY TOOL & BODY CO.
CLINTONVILLE, WISCONSIN

CIRCLE 52 ON READER SERVICE CARD

NOW...
TROUBLE-SHOOT TROUBLE SPOTS FAST
Save valuable Man-hrs.

DICE MICROHM METER
Favorite of leading utilities for all low-resistance measurements on material tests, circuit breaker contacts, bus bar connections, cable joints.
MEASURES DOWN TO *ONE* MICROHM!
J. W. DICE CO. ENGLEWOOD, N.J.

CIRCLE 53 ON READER SERVICE CARD

HOW TO SEAL LEAKING TRANSFORMERS

No welding or soldering . . . no special equipment . . . five minute's labor. With Epoxylite® Black Sealer Paste, you can stop transformer leaks in a matter of minutes—no disassembly required, no expensive down-time involved. Simply wire brush the bonding area, stir the catalyst into the Sealer Paste, and apply. Catalyzed paste stays right where it is put, sets hard in a few hours.

The Black Sealer Paste is now being used by more than 150 utilities and over 200 motor repair shops in dozens of time- and money-saving applications, for on-the-spot repair of transformer bushings, cracked terminal boards, chipped commutators . . . used to seal leaking oil-filled cables, waterproof connections, bond brush-holder studs.

One customer saved over $135,000 in two years through use of Epoxylite in a single one of 20 applications. Admittedly, that's exceptional, but many customers frequently save the cost of the entire kit through the use of a single one of the jars.

Epoxylite Sealer Kit #1 contains twenty jars of the Black Sealer Paste—each jar enough for one maintenance or repair application. The handy, versatile Kit #1, complete with full instructions, is priced at $28.80, f.o.b. El Monte, California.

Prove to yourself that you can save money in dozens of electrical maintenance and repair applications by ordering a kit today. To place your order, on a satisfaction-guaranteed basis, write or phone:

THE EPOXYLITE CORPORATION

P. O. Box 3397 South El Monte, California
CUmberland 3-8231

or, for a full description of the Kit and a list of 21 proven uses, please write for our free literature.

More Literature

(Continued from page 128)

TRUCK COST RECORD . . . books and forms for daily reports, made out by drivers, to assist truck users in evaluation equipment performance. Each book permits accurate record of all fixed, operating and maintenance charges against one truck for full year—Form AD-20, 20 pages. Driver daily report, used in conjunction with book, for detailed reports on trips, AD-26. International Harvester Co, Consumer Relations Dept, 180 N Michigan Ave, Chicago 1, Ill. **(191)**

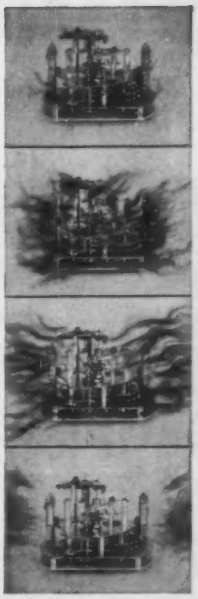
TRANSFORMERS

SUBSTATION TRANSFORMERS . . . liquid-filled, single, and 3-phase, 501 to 10,000 kva, up to 69 kv. Custom-designed. Standard features illustrated and described; details on standard and customer-specified testing procedure. Specifications guide. Bulletin 5800-1A, 16 pages. I-T-E Circuit Breaker Co, Dept A-4, 1900 Hamilton St, Philadelphia 30, Pa. **(192)**

DRY-TYPE TRANSFORMERS . . . single and 3-phase general-purpose, autotransformers, buck-boost, distribution and voltage-stabilizing transformers. Also covers mercury-lamp ballasts, integral distribution centers, portable oil testers and portable insulation testers. Specifiers' and Buyers' Guide, Bulletin GEA-6907A, 24 pages. General Electric Co, Schenectady 5, N. Y. **(193)**

DISTRIBUTION TRANSFORMERS . . . pole-type, 167, 250, and 333 kva, 15 kv and below, "Featherweight Pole Star." Design and construction details, weights and dimensions for all standard ratings. Bulletin D-560, six pages. Pennsylvania Transformer Div, McGraw-Edison Co, Box 330 Canonsburg, Pa. **(194)**

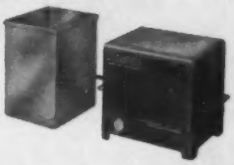
THREE-PHASE TRANSFORMERS . . . for underground distribution, 75 to 300 kva. Construction features, dimensions and weights. Chart on designations of voltage ratings. Bulletin 300, eight pages, R T & E Corp, 1900 E North St, Waukesha, Wis. **(195)**



CLEANER METERS-FASTER

with the

AUTOSONIC SELF-TUNING ULTRASONIC CLEANER



Meters, demand registers, timers, insulators, pole line hardware — no matter how complex, no matter how dirty — can be cleaned by the Powertron Autosonic faster, cleaner, and cheaper. What's more, the Autosonic cleans your units intact — including pivot holes — without expensive, time wasting disassembly.

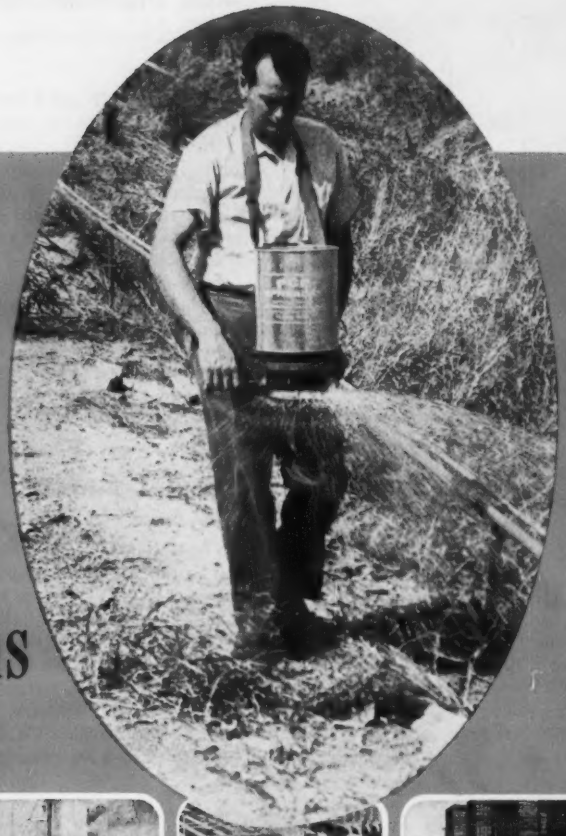
The Powertron Autosonic has an exclusive integral feedback control system that continuously tunes it electronically to give you constant, peak cleaning efficiency. The Autosonic has simple, one switch control — no tuning knobs or meters — so it requires no monitoring or operator training.

The self-tuning Autosonic . . . gives you cleaner units every time even with an unskilled operator . . . saves labor and material costs . . . makes your maintenance and salvage programs really pay off.

WRITE FOR FREE BULLETIN 60-1 "HOW TO CLEAN ULTRASONICALLY WITH SELF TUNING"

POWERTRON ULTRASONICS CORP.
DEPT. EW10 • PATTERSON PL., ROOSEVELT FIELD
GARDEN CITY, L.I., N.Y. • Pioneer 1-3220

the answer to industrial weed problems



SECURITY FENCE LINES

OUTDOOR STORAGE AREAS

RAIL SIDINGS

PETROLEUM INSTALLATIONS

LUMBER STORAGE AREAS

any man can weed-proof 10,000 sq. ft. in ten minutes

with **UREABOR®** This is the weed killer that's setting new standards for big economy with maintenance men from coast to coast. During the past six years, users have proved that, for low cost, safety, effectiveness . . . ease of application . . . UREABOR can't be beat!

Here is the dry granular weed-killing material that is always ready for you to use. There's nothing to mix — no water to haul. To destroy unsightly and hazardous weeds and grasses for a full season, you'll only use 1 to 2-lbs. per 100 sq. ft. That's because UREABOR combines the plant-destroying powers of *two* proven herbicides to give both a quick kill *and* a long-lasting control.

A special spreader is made to apply UREABOR uniformly and fast at low rates. Its low-cost does not reflect the tremendous value of this spreader to any user of UREABOR since it enables a man to weed-proof any area at the rate of a thousand feet per minute! If you have a weed problem, we want you to have the full story about UREABOR weed killer. Write today for details and name of a near-by distributor.

U.S. BORAX

UNITED STATES BORAX & CHEMICAL CORPORATION, Agricultural Sales Dept., 630 Shatto Place, Los Angeles, California

READERS SERVICE

For more information on anything in this EUM Report, simply fill out and mail this card ▶

FOR MORE INFORMATION ON...

New Equipment Items—Circle the number corresponding to the one at the end of the item. Fill out and mail.

Manufacturers Literature—Circle the number corresponding to the literature item. Fill out and mail.

Products Mentioned—For more information on any product mentioned in an article (not a New Equipment Item), circle the number corresponding to the one at the end of the article. Fill out and mail.

Products Advertised—Circle on the Reader Service Card the number corresponding to the key number appearing at the base of the ad. Fill out and mail.

PLEASE RETURN THIS CARD WITHIN 30 DAYS TO INSURE RESPONSE

Have you reserved your "Methods" reprints?
If you are not already an Electrical World subscriber, but would like to get the "Electric Utility Methods" Reports, just fill out the return card on the opposite side of this page and we'll reserve them for you. All 6 reprints for only $1.00!

PLEASE MAIL WITHIN 30 DAYS

Readers Service

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	
73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	
91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	
109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	
127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	
145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	
163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	
199	200																	

Name.....Title.....

Company.....Dept.....

Address.....

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY MAIL
First Class Permit No. 64, (Sec. P. L. & R.) New York, N. Y.

Postage Will be Paid by Addressee

Reader Service Department
ELECTRICAL WORLD
330 West 42nd Street
New York 36, N. Y.

ATTENTION

ENGINEERS AND SUPERVISORS

with responsibilities in Construction, Operation, Maintenance, Safety or Stores

YOU NOW HAVE A CHOICE

Be sure of getting your personal copies of Electrical World's new "Electric Utility Methods" Reports—written exclusively for your job needs! It's easier now than ever before . . .

2 ECONOMICAL WAYS TO GET THE "METHODS" REPORTS

1—Reserve your "Methods" Report reprints, and they'll be mailed to you 6 times each year as soon as they're off the press. All 6 for only $1. Or . . .

2—Subscribe to Electrical World for one year at $6, and get the "Methods" features every week for 52 weeks, including the 6 big wrap-up issues like this one!

WHICH IS RIGHT FOR YOU?

If your main responsibilities are in construction, operation, maintenance, safety, or stores, the 6 "Methods" reprints will provide a wealth of job-tested help in return for a very minor investment or . . .

If these areas are only part of broader responsibilities, then you'll get the most from the weekly "Methods" features, plus the 6 "Methods" Reports like this one, plus the whole, detailed industry picture brought to you weekly through the pages of Electrical World!

Fill out and return card today

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY MAIL

First Class Permit No. 64, (Sec. P. L. & R.) New York, N. Y.

Reader Service Department
ELECTRICAL WORLD
330 West 42nd Street
New York 36, N. Y.

Postage Will be Paid by Addressee

You're right, Electrical World!...

☐ My job is heavily concentrated in construction, operation, maintenance, safety and stores. I'll get top value from the 6 "Electric Utility Methods" Reports reprints for just $1.00!

☐ I need this "Methods" feature every week, plus everything else in Electrical World. Please enter my subscription for 1 year at six dollars, to start immediately!

☐ Bill company ☐ Payment enclosed ☐ Bill me

Name.....

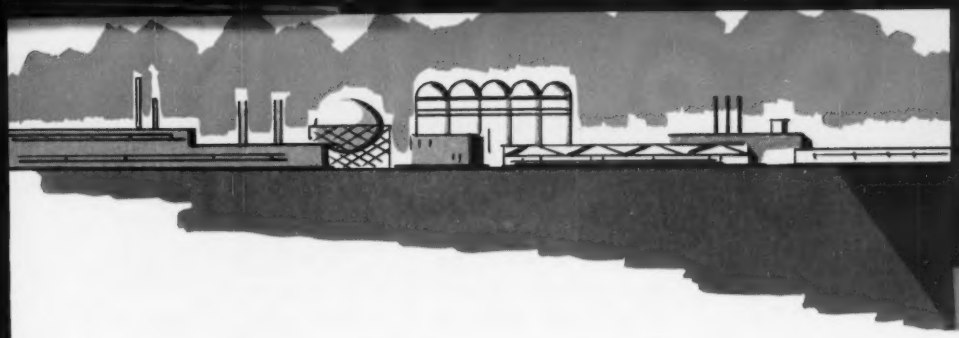
Address..... ☐ Home ☐ Business

City.....Zone.....State.....

Company.....

Title.....Dept.....

Nature of Company Business.....

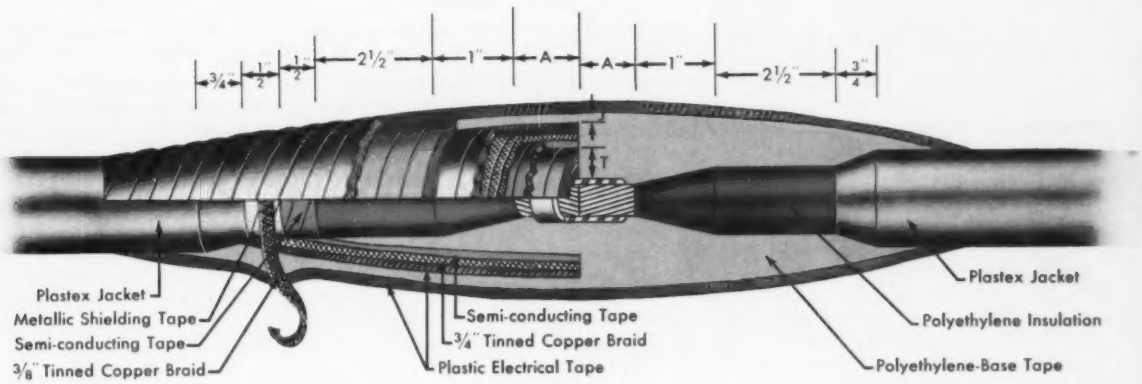


Simplex
INDUSTRY
SERVICE
INFORMATION

FORM NO. 1104

Instructions for Splicing

Single Conductor, Polyethylene Insulated, Shielded, Plastex Jacketed Cable
to
Single Conductor, Polyethylene Insulated, Non-shielded, Plastex Jacketed Cable



A = ½ the length of the connector plus ½"
T = 1½ times the factory-applied insulation thickness
J = 1½ times the factory-applied jacket thickness

I. Procedure

a. Train both cables into position and cut them off squarely so that they butt.

II. Preparing the shielded cable

a. Remove the Plastex jacket from the end to be spliced for a distance of 5" plus one-half the length of the connector. Do not make a ring cut in the jacket because of the danger of cutting the metallic shielding tape and insulation.

b. Unwrap the cable metallic shielding tape and the semi-conducting tape and cut each tape so that it extends one-half inch beyond the preceding tape or jacket. *Be careful not to cut the conductor insulation.* The semiconducting tape may be bound in place with thread or fine string to prevent it from unraveling. The metallic shielding tape should be tacked in place with solder.

c. Remove the insulation from the end of the conductor for a distance (A) equal to one-half the length of the connector plus ½". *Be careful not to nick the conductor.*

d. Taper the insulation end smoothly for a distance equal to one inch.

Care must be taken to see that the taper is smooth so that no voids will remain after the joint is insulated. Sandpaper or a rasp may be used to buff the taper. *Emery paper should not be used for it contains metallic particles.*

e. Taper the jacket end smoothly for ¾". Sandpaper or a rasp may be used to buff the tapers.

f. Scrape all the exposed insulation thoroughly with a knife. Clean the surface by wiping with a cloth dampened with solvent *in order to remove any loose threads or conducting particles that may remain from the semiconducting tape.*

III. Preparing the non-shielded cable

a. Remove the Plastex jacket from the end to be spliced for a distance of 4" plus one-half the length of the connector.

b. Remove the insulation from the end of the conductor for a distance (A) equal to one-half the length of the connector plus ½".

CIRCLE 133 ON READER SERVICE CARD

c. Taper the insulation end smoothly for a distance equal to one inch.

Care must be taken to see that the taper is smooth so that no voids will remain after the joint is insulated. Sandpaper or a rasp may be used to buff the taper. *Emery paper should not be used for it contains metallic particles.*

d. Taper the jacket end smoothly for ¾". Sandpaper or a rasp may be used to buff the tapers.

IV. Splicing the conductors

a. Join the conductors with a compression type connector, and fill the indentations with a suitable compound, such as lead wool, duct seal, etc., so *the connector will have a smooth outer surface.*

b. Apply polyethylene cement to the exposed insulation and *allow it to dry. Do not apply polyethylene cement between the layers or over polyethylene-base tape.*

c. Tape over the joint and all the exposed insulation with polyethylene-base tape, *being careful not to cover the semiconducting tape at the end of the shielded cable.* Wrap the polyethylene-base tape ½ lap in successive layers until the thickness over the connector is equal to 1½ times the thickness of the factory-applied insulation. In wrapping the tape, stretch it until its width is approximately ½". Even tension should be used so that each layer is of uniform thickness and density. *Keep the tape free of dirt and moisture.*

In order to reduce the strains of stretching the tape and to prevent voids between layers of the tape, the insulated joint may be compressed by applying a highly elastic rubber tape over it. Two layers of the elastic tape should be tightly wrapped over the insulated joint with a ½ lap. It should be left on for three minutes and *then removed.*

d. Wrap a layer of semiconducting tape over one half of the insulated joint, starting at the midpoint, and taping toward the end, overlapping the semiconducting tape of the shielded cable. *The semiconducting tape should be applied smoothly and be in intimate contact with the insulated joint.*

f. Wrap a layer of ¾" tinned copper braid shielding tape over the semiconducting tape with a ¼ to ½ lap, overlapping the cable metallic shielding tape at the end of the splice (as shown in the drawing). *The ¾" tinned copper braid shielding tape should be in intimate contact with the semiconducting tape.* Experience has shown that the ¾" tinned copper braid shielding tape should be wrapped from the center toward the end. This allows the taping to be done in a "downhill" direction. Solder the end of the ¾" tinned copper braid shielding tape to the metallic shielding tape of the cable and make a continuous track of solder, approximately ⅜" in width, across the ¾" tinned copper braid shielding tape running from end to end.

CAUTION — Polyethylene can be damaged by excessive heat, therefore, use extreme care in all soldering operations.

To ground the shield at the splice, solder a ⅜" tinned copper braid ground strap to the cable metallic shielding tape. *The ground strap must be thoroughly soldered to the cable metallic shielding tape and the ¾" tinned copper braid shielding tape, and it must be clamped or soldered to a good electrical ground.*

The cable metallic shielding tape must be grounded at each end on a long cable run and at one end on short runs. Where a cable is provided with a ground lead, attach it securely to a low resistance ground. Ground clamps may be used but they should provide good electrical contact.

g. Wrap one layer of Plastic Electrical Tape with a ½ lap over the ¾" tinned copper braid shielding tape. *The plastic tape must not be stretched.* Tension should only be that required to lay the tape on smoothly so that no wrinkles remain. In cold weather, the tape should be warmed before applying.

h. Scrape each jacket taper and 2" behind its shoulder with a knife. Clean the surfaces by wiping them with a cloth.

i. Apply polyethylene cement to the cleansed sections and *allow it to dry. Do not apply polyethylene cement between the layers or over the polyethylene-base tape.*

j. Tape over the cemented sections of the jacket and the Plastic Electrical Tape with polyethylene-base tape. Wrap the tape with a ½ lap in successive layers until the thickness over the joint is equal to 1½ times the thickness of the factory-applied jacket. In wrapping the tape, stretch it until its width is approximately ½". Seal the ground strap, extending from the splice, with a few layers of polyethylene-base tape.

k. Cover the entire splice with two layers of Plastic Electrical Tape applied with a ½ lap and extending 1" beyond the polyethylene-base tape at each end. Cover the polyethylene-base tape on the ground strap with two layers of Plastic Electrical Tape, allowing it to extend onto the strap.

Simplex Splicing Tape – To insure the best possible splice under all conditions, it is recommended that Simplex Splicing Tape be used. Ask your Simplex man about splicing tape for all applications.

Splicing is the purchaser's responsibility. The instructions should be read and carefully followed by the person or persons splicing the cable. Any troubles resulting from failure to follow these instructions are not the responsibility of the manufacturer.

Simplex

WIRE & CABLE CO.

Cambridge, Mass. • Newington, N. H.

Home Lighting Needs Marketing Fundamentals

Complex market and lack of aggressive promotion holding back realization of residential lighting potential

ROY A. PALMER, Illuminating Engineer, Duke Power Co, Charlotte, N. C.

Utilities have been looking at the residential lighting load through the wrong end of the telescope. While other lighting fields, commercial and industrial, have been promoted because the kw increase can be readily determined, the home lighting market has been neglected because definite results are hard to pinpoint. Homes are therefore dim, dreary and glareful. It indicates that a further discussion of this situation is warranted.

Aside from the fact that electric utilities have a selfish motive in increasing lighting kwhr in homes, an equally if not greater reason might be responsibility to bring the advantages of better lighting to the residential customer. Eyesight conservation, safety, better scholarship for young students, clean, cheerful atmosphere and decorative beauty are a few of the advantages.

In any promotion program it is necessary to utilize every avenue of approach to achieve desired results. Giving away lamp bulbs and lamp selling campaigns are useful but are only a narrow, single lane street to get better lighting in the home. Lamp bulbs are made more readily available but the purchasers do not learn anything about how to provide better lighting, perhaps other than to use a larger bulb—and that won't necessarily assure better quality lighting. To get to the rock-bottom reason for poor home lighting will enable utilities to plan campaigns more effectively.

Almost everyone who builds a new home leaves the lighting until the house is finished. Then a visit is made to a fixture dealer's showroom to select lighting equipment. More than likely the budget is already overspent. The prospective homeowner knows nothing about the functional value of the fixtures he selects. He picks out fixtures either because they "look pretty" or will "fit" in a certain room, or because they don't cost much. As a result, beauty as well as eyesight suffer.

Home lighting should not be a matter of selecting fixtures after the house is built. To achieve good results, the lighting must be planned when the house is being planned. Those involved in the planning must learn that no equipment must be recommended that will reveal areas whose brightness will be objectionable when the lamp is turned on—which is so often true.

Also, when a couple are about to purchase a ready built house, they are not sufficiently well informed to observe and properly appraise the lighting. Neither do they try to determine if the wiring is even reasonably adequate, which might allow addition of more lighting equipment before they move in or sometime in the future.

Education and Promotion Needed

All surveys and studies of the home lighting market indicate that a strong and continuing program of education and promotion is necessary. Homeowners, architects, fixture dealers and manufacturers, electrical contractors, builders and others involved should learn that any area which presents discomfort because of brightness or excessive contrast should be avoided. While lighting fixtures must be decorative, they must also provide good lighting without brightness.

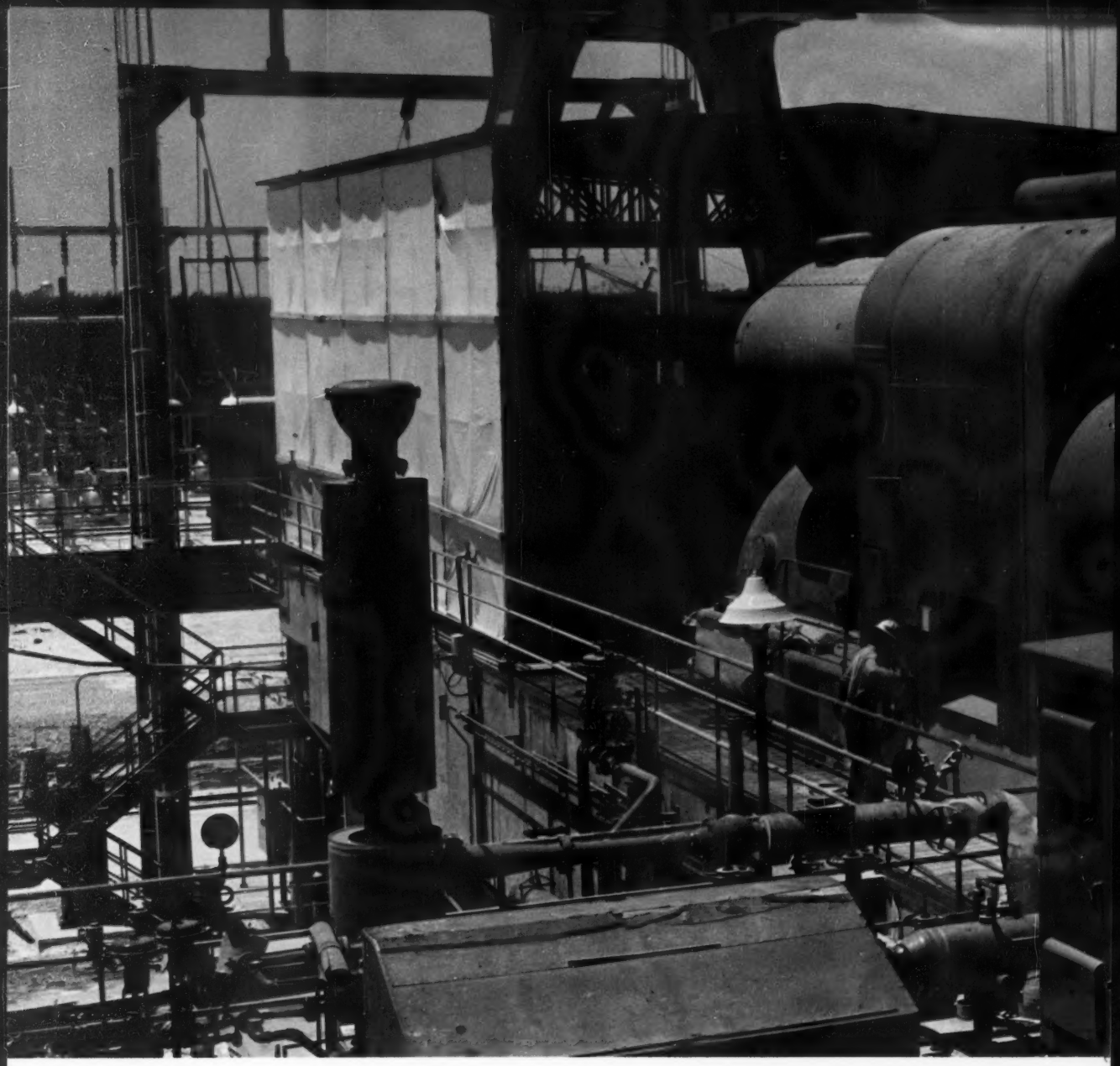
The objection of some homeowners to built-in lighting as reported in *Electrical World's* Special Report on Living With Light (EW, July 18, p 47-58) suggests that there might be poor installation of equipment. It is often found that the electrical contractor uses the wrong type of downlights. One case in point is where a contractor installed the type of downlight which permitted the 150-w reflector lamp to extend below the ceiling. The brightness of course was so extreme that the homeowner never turned the lamps on and condemned all types of downlights. Also, there are frequent instances where the contractor places a fluorescent channel for a valance light directly on the wall above the window. When the drapes are installed, the light from the lamps falls behind the drapes instead of washing the front of them.

Poor installations will discourage and hamper progress in home lighting. Continual instruction and follow-up is necessary to assure proper equipment and installation.

Another fundamental factor which must be recognized is the preference of many housewives for antique lighting fixtures. This is especially prevalent in sections where there are houses of traditional design. Crystal chandeliers, candles, lanterns and kerosene lamps did not provide good illumination back in the days before electric lamps. Attempts to electrify them can only result in discomforting glare because the electric lamps are several hundred times brighter than the light sources originally used in these fixtures.

Utilities should not try to discourage the use of these fixtures, but should insist that small, low-powered lamps be used which have not much greater brightness than the original light sources. Since these fixtures cannot be depended on for illumination, there must be

(*Continued on page* 146)



Florida Power & Light Company selects Gulfcrest® oil for

GULF MAKES THINGS

This leading Florida utility has learned from experience that Gulfcrest oil gives years of trouble-free performance. Since 1948, Cutler station turbine generators have been lubricated with Gulfcrest. And after 12 years, the original fill of Gulfcrest is mighty close to new-oil specifications.

So naturally, Florida Power & Light chose Gulfcrest for the 240,000 kw turbo generator in the new Port Everglades station. Gulfcrest has an unmatched record of performance in every type and make of steam turbine generator. This oil has served continuously in many large generators for over 20 years—with neut numbers still low, systems free from sludge and rust. That's why, in Gulf's marketing territory, more power is generated by central station turbines lubricated with Gulfcrest than with any other oil.

See for yourself how Gulf makes things run better! Just call your nearest Gulf office. Or write for fully illustrated Gulfcrest booklet.

Dick Norman, right, Assistant Plant Superintendent, with J. S. Bailey, Gulf Sales Engineer, in front of the new 240,000 kw generator.

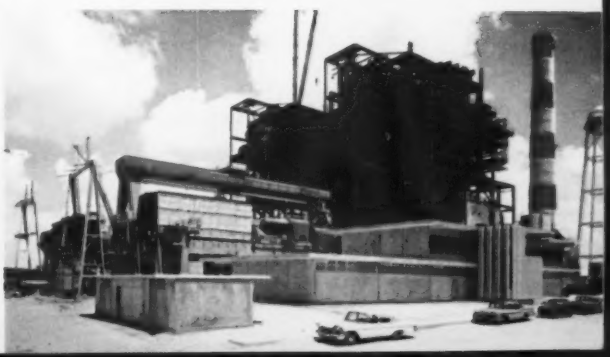
new Port Everglades turbine generators because . . .

RUN BETTER!

GULF OIL CORPORATION
Dept. DM, Gulf Building
Houston 2, Texas

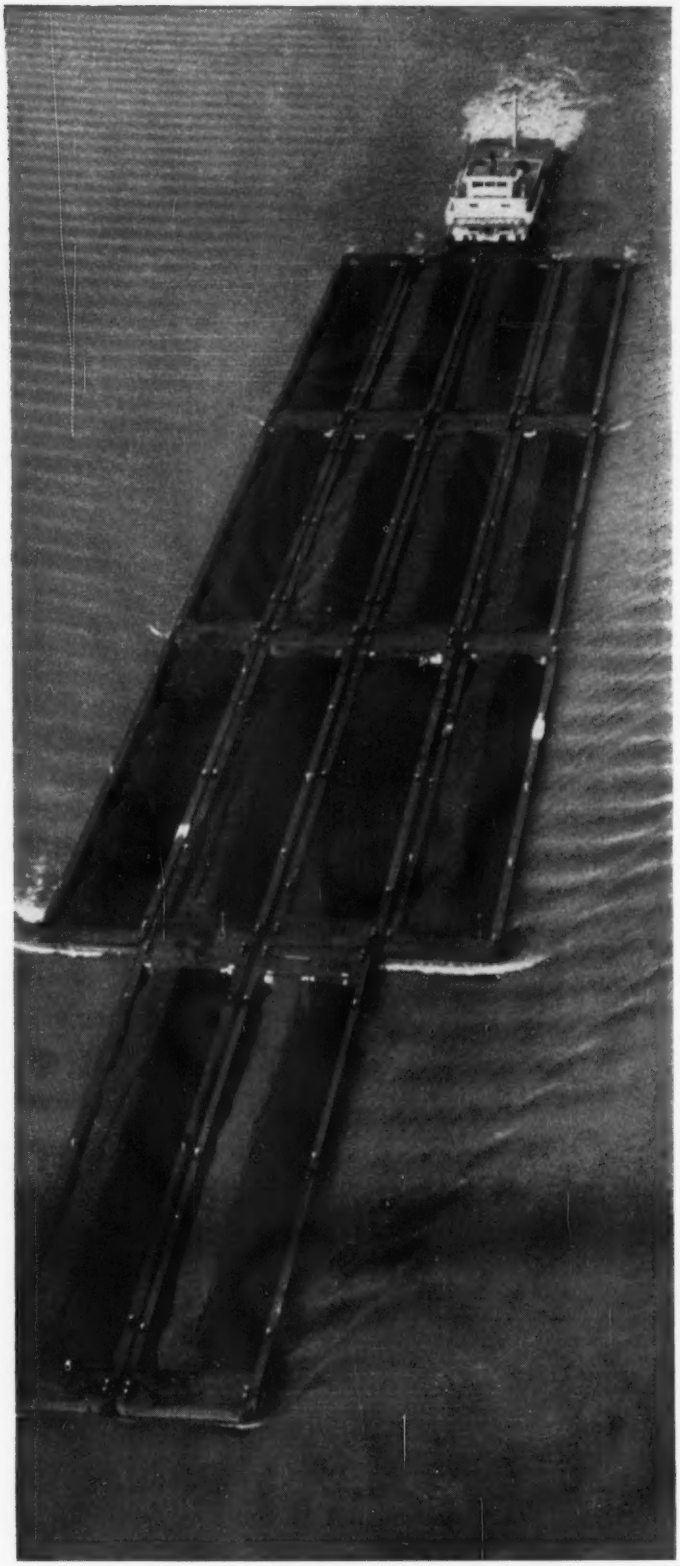
GULF

View of the new Port Everglades station. It's lubricated entirely with Gulf products. Operations began in June. A second turbine generator is now being built and is scheduled to be in operation by 1961.



how does 1970 look... from here?

(and how about 1980?)



The most look-ahead industry in the nation is undoubtedly the electric utilities. Glance back over the past 10 years and the reason is obvious. And with even greater electric needs forecast for the next 10 and 20 years, it's not surprising that any remaining short-term thinking about the way to buy *coal* is giving way rapidly to the same *long look ahead.*

There is increasing awareness that behind an attractive invoice price can be the hidden incremental costs of excessive coal handling, ash handling, equipment outages, freight charges on inerts, operating inefficiencies of many kinds.

There is increasing interest in quality coal that delivers *steam* at the lowest *net* cost. There is increasing interest in adequate reserves, in uniformity of supply, in suppliers in a position to deliver the right kind of coal on a reassuring long-term contract basis.

An increasing number of utilities are looking to Island Creek as a supplier of such coal . . . and such reassurance. We'd welcome a chance to discuss this matter more specifically with you. Write, wire or phone.

You can depend on Island Creek
. . . a career company dedicated to coal

ISLAND CREEK Precisioneered Coals

ISLAND CREEK COAL SALES COMPANY, Chafin Building, Huntington 18, West Virginia • Chicago • Cincinnati • Cleveland • Detroit • Greensboro • New York • Pittsburgh

Electrical World

OCTOBER 24, 1960

Management Newsletter

Survey of 8 Utilities Shows These Employee Attitudes:				
How would you rate your company as a place to work . . . ?	Good	Average	Poor	Undecided
Hourly Employees	70%	25%	2%	3%
Supervisory Employees	84%	14%	1¾%	¼%
White Collar Employees	72%	25%	3%	1%
Data: Opinion Research Corporation				

Industry Studies Motivation as Output Tool

A utility is a "good" place to work, as the above figures show. So are oil refineries, machinery producers, and paper companies, it turns out. While this is interesting, much more relevant is the fact that such figures are not just curiosities. Many modern companies take them very seriously indeed. It's all part of a new process of corporate introspection, in which companies examine themselves, through the eyes of rank-and-file employees and outsiders to uncover and diagnose ills they very often didn't know existed. Hoped for is a better way to manage industry's human resources.

In building its structure, industry has, until recently, mimicked the past. It has drawn heavily from the only available precedents—military and religious organization. The principles of hierarchy, specialization, and unity of command have served industry well. But, the fact remains that something else might work better. Much better. For the classical principles of military and religious organization were designed to promote conformity and order—not to produce goods and services for sale and profit. Thus, modern industry considers the classical style of getting things done in business, which includes threats, coercion, and blind obedience, as old-hat. Positive motivating is replacing authoritarian rule in business.

Once employee motivation becomes a critical concern, supervision takes on a new meaning, in a much less mechanical, much more difficult vein. For it requires supervisors who focus not on the work, but on the people who are doing it. What is emerging is what Rensis Likert, in "Modern Organization Theory," calls the "supportive boss." He is a boss who is helpful rather than critical, who believes in the capacities of his people and expects a lot from them, and who uses participation of the group to build loyalty. Such loyalty cannot be *built* effectively on a

grand scale within a company. It must grow within the individual workings, as they actually exist, entirely apart from the rigid structure of organizational charts.

But though the needs of employees are taken more seriously, the needs of the organization must still be uppermost. The goal is still improved earnings. The change is a change in method—overhauling the conventional ways to attain this goal. Realistic managements have replaced the static structure of the organization chart with the shifting reality behind it. In fact, the organization is static only on paper. In operation, it is an ever-changing complex of group interactions. Actual lines of communication and authority change constantly. So do morale levels, productivity, and the degree of involvement or apathy of employees. In other words, the organization itself is a living creature which must not neglect its constitution. To remain healthy, legitimate needs of both individual and the company must be kept in balance.

One starting point in striking such a balance is to peer into the workings of the organization to find, actually, what is going on. What does this so-called self-examination process, generally show? Here are some actual results of studies made by Opinion Research Corp. The perspective it gives is not limited to the 78 separate studies providing the data. Instead, the facts outlined below are recurring in virtually all large companies.

What Self-Analysis Studies Tell About American Industry

Most employees are quite proud of their company. Most feel they are above average places to work. But this enthusiasm varies with the job. Supervisory and white-collar people tend to be more enthusiastic about their companies than hourly employees are. Utilities, by the way, rate very well as places to work. For example, Opinion Research studies, based on eight utilities, show that 70% of hourly employees feel their company is an above-average place to work; The average for hourly employees in all other industries studied is only 59%. Likewise, while 84% of utility supervisors rate their company above average, the figure for non-utility supervisors is only 72%. And utility white-collar employees rate their companies a trifle better than their non-utility counterpart.

However, there is a significant spread in the way employees evaluated these eight utilities. The chart on the opposite page shows the variation from one company to another and from one type of employee to another. It also shows how utilities stand relative to other industrial companies surveyed. In the tabulation shown, hourly employees are mostly manual workers; white-collar workers, principally clerical, usually with a high component of women.

There can also be great variation in attitudes within the same company. Thus, in one utility studied, one division was rated highly as a place to work by its hourly employees, but another division of the same utility came out well below average. This suggests that it is not so much overall company policy that shapes an employee's view of his company, but how these policies are carried out by individual managers.

Most people are also enthusiastic about the way they make their livelihood. In all the utilities, at least 92% of the hourly workers reported their response to the type of work they did as average or good. And among the five companies rated highest on this question by hourly employees, three were utilities. Studies also show that pay is not as much a focal point of unrest as many executives suppose—but opportunities for advancement are. Of all the companies polled, only in three did more than one-quarter of the employees complain about pay. More notable is a feeling of being boxed in on promotion. Advancement opportunities head the list of "things liked least about my job." From management viewpoint, there are always more promotion opportunities than good people to fill them. But, certainly, this view is not shared by most employees.

Here's How Employees Rate Eight Utilities as a Place to Work

	Hourly			Supervisory			White-Collar		
	Good	Average	Poor	Good	Average	Poor	Good	Average	Poor
Other Industry—High....	90	9	—	98	1	—	92	6	—
Utility A (Gen. Office)....	81	19	—	79	21	—	68	28	4
Utility B	77	19	3	89	4	7	64	32	3
Utility C	73	24	2	85	14	1	82	13	3
Utility D	73	23	3	91	8	—	79	20	1
Utility E	72	24	2	82	18	—	62	32	3
Utility F	71	27	1	83	15	2	—	—	—
Utility G	56	25	4	89	11	—	82	16	2
Utility H	51	41	4	75	23	1	67	31	1
Other Industry—Low.....	24	47	24	51	39	7	34	52	12

Where total shown for any group is less than 100%, difference represents employees with no opinion

"Promotions are arbitrary." This is a gnawing concern of many people in large companies. Even among the highest-rated companies, white-collar and hourly people complain bitterly about the fairness of promotions. Supervisors show considerably more satisfaction with the promotion process—probably because they are actively involved in the actual decisions on advancement. But even in this group, seldom do more than two-thirds of the employees rating fairness as "good." Promotion means more than money to people; it has a symbolic value. Hence, it is very important in motivating employees. A promotion means more challenge to a man's abilities, and more importance in his company. Both satisfy basic human needs. Whether the promotion process is fair or not, the employee's marked sensitivity on this point is a symptom of unfilled needs for self-esteem and recognition, industrial psychologists say.

Moreover, most feel they know too little about their companies. This probably comes as a surprise to management. Leading companies have gone to great length and expense to set up elaborate communications to all their people. Yet, surprisingly, less than half, even among supervisors, are completely satisfied with the information they are getting from their companies. Employees seem to yearn for more information about their companies. This may stem from their feeling of being outsiders, not an integral part of the organization. In a group of 46 companies studied, by far the majority of employees rated the information they were getting as "not enough." By the way, the three utilities in this study ranked well down in the list. In the highest ranking utility, only 44% of hourly employees and 53% of supervisors felt they got enough information on all company policies and operations. In two others, less than 30% of either was satisfied. On the other hand, a large majority of all employees in all groups of 38 companies felt they could believe what the company said about its policies and operations—and here the utilities studied showed up relatively well.

Another interesting revelation concerns work load. The average manager believes his people can turn out considerably more work than they do. But very few employees would agree with him—usually about 10% of the hourly employees and 15% of the white-collar groups. The others felt they were working at their peak. And employee views on work load are supported by management's view of its own work load—most managers say they could not turn out more work. The crucial point is not whether employees actually can do more work, but that they believe they cannot. How, then, can more work be produced? The direct and obvious approach—pressuring people to do more—leads to immediate resistance from employees. However, people can be encouraged to work smarter, rather than harder. And in doing so, they will get more satisfaction from their work—in addition to turning in a better performance. More work is a by-product of heightened interest and involvement in the job.

But how in the world can a company spur this involvement on the job? The key lies in supervision. If they are to develop all their people, companies must pay particular heed to developing high-grade supervisors. Management, of course, must take on the burden of supervisory development. But this poses a problem. There is a serious question as to whether management is capable of doing so at this time. At least in adequate fashion. For people in industry generally don't rate those above them as being very adept at developing others, or at showing them how to do their jobs better. And this goes not just for rank-and-file employees, but is a common opinion of supervisors themselves about their own bosses.

Even in the best rated companies, only about one-half of the supervisors rate their own bosses as being good at "helping you get ahead." Most people, however, grant that their bosses do know the specifics of their jobs. (Utilities, especially among hourly employees, rate well here.) Thus, even if the top men in a company believe in "developmental" management, the hurdle of getting the policy understood, and put into practice, remains.

How Companies Look at Their Inner Selves

The details above, which, of course, may or may not be an accurate picture of things as they are, came to light through corporate "self examination." Here's how it works:

• **First, preliminary discussions with management** outline problem areas, and permit reluctant managers to satisfy themselves of the value of the examination program.

• **Second, the first round of depth interviews.** Outside investigators range through the organization, asking questions they hope will verify and clarify management's definition of sore spots. At this point, the investigators can begin to see the actual functioning of the organization, as opposed to supposed functioning. Information is assembled to put together a detailed questionnaire that will be used to either prove or disprove theories developed about the workings of the organization.

• **Third, the questionnaire** is administered to everyone in the company, anonymously, of course. The questionnaires are filled out by employees themselves, since this is found to be the most efficient way to draw everyone into the process. In fact, experience shows that being asked to fill out the questionnaire is the first indication many employees have ever had that anybody cares for their opinion.

• **Fourth, follow-up depth interviews.** These try to get to the causes behind the symptoms shown in the questionnaire. This exploration is considered essential to make interpretation of the questionnaires as meaningful as possible and to complete an understanding of the complex relationships of the organization.

• **The final steps are, of course, a report back to management** and, interestingly, a report back to all who took part in the study. This report to rank-and-file employees is an expression of good faith. But it is more than that. It helps stimulate discussion among employees, and the interest needed to build acceptance for any ensuing changes. In actual practice, this part of the self-examination process builds a sense of personal involvement with the organization goals and objectives. Reception to it by the average employee is usually enthusiastic.

The result of such activity, organization theorists say, is to uncover festering trouble spots that may go unnoticed, and which, with the inertia of a large corporation, may not show up at all until reflected in operating results. By then, damage to an organization's health may be severe. It could take a long time to remedy. "Every leading industry," Opinion Research warns, "has examples of companies that have gone behind because the organization was too slow in adopting the changes required to hold its own."

FOR AUTOMATIC CONTROL OF STEAM STATIONS

An RW-300 system in a steam station can pay for itself by improving service continuity, increasing safety for personnel and equipment, and reducing operating and maintenance costs. RW-300 computer control can reduce the probability of major accidents, decrease the number of outages, and ensure faster return to service following an outage. In addition, through monitoring plant performance and computing heat rate, computer control can provide significant fuel savings.

Many utility leaders are now considering computer control of boiler-turbine-generator units, and uppermost in their minds is the question of system reliability. Field reliability can be proven only by on-line systems standing up under continuous service in rugged industrial environments. Every day more than a dozen RW-300 systems are operating around the clock in a variety of industries.

For further information, call or write Mr. Dan L. McGurk, Manager of Sales.

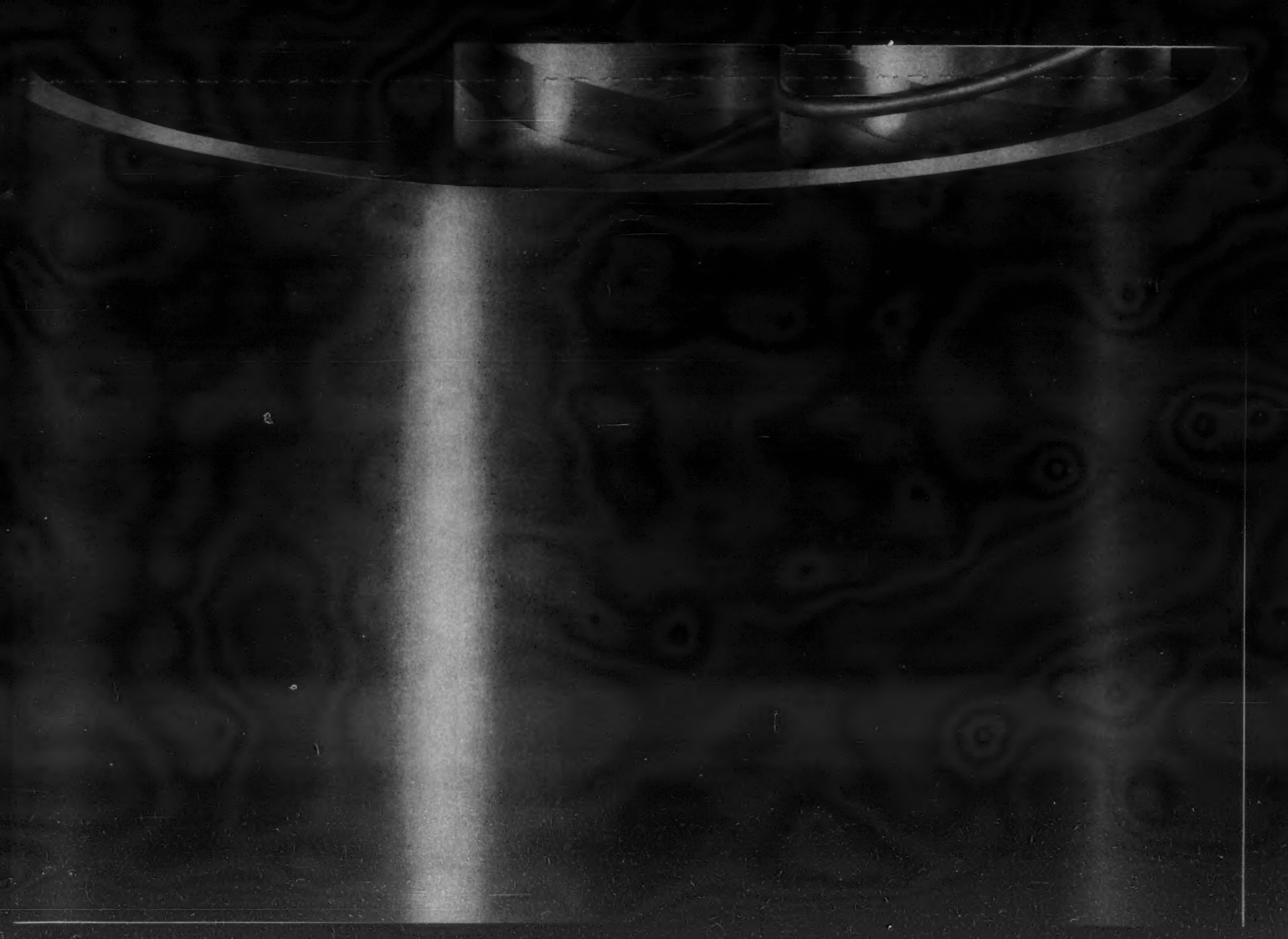
RW-300

the most field-reliable computer control system . . .

TRW Computers Company

a division of ***Thompson Ramo Wooldridge Inc.***

202 NORTH CANON DRIVE • BEVERLY HILLS, CALIFORNIA



ANACONDA®
designs
and
makes both
ACCESSORIES
and EHV cable

The same engineering teams research, develop and use-test both EHV accessories and cable at Anaconda. The advantage is clear: no weak links in the system.

This coordinated effort has another customer benefit —special accessory problems can be considered when the system is designed. For example:

One customer needed a semi-stop joint that would not only locate faults and isolate any pressure loss in HPOF pipe-type cable, but would also let the cable move longitudinally without disrupting the seal or crushing the insulation. Anaconda met both requirements with a flexible barrier design that also matched cable characteristics perfectly.

In another typical case, a customer desired a preassembled termination unit that would provide controlled bending and fast sealing of pipe-type cable during the difficult pull to the first manhole. Furthermore, the customer's operating requirements would allow no welding either during or after the pull. Anaconda answered the problem with a "drop-casing" terminal assembly that proved to be a unique solution.

These examples won't necessarily parallel your own requirements, but they do demonstrate Anaconda's capacity to develop specialized accessories that meet the requirements of the customer and the cable equally well. To find out specifically how Anaconda's Integrated Approach can solve your EHV accessory problem, contact Anaconda Wire and Cable Co., 25 Broadway, New York 4, New York. 60227

See the man from
ANACONDA®
for accessories

P & K OUTDOOR LIGHTING REPORT

the Modern Trend in LOW LEVEL LIGHTING

TOP PHOTO: Location: Fairleigh Dickinson University, Madison, N. J. • Electrical Consultant: H. L. Sykes
LOWER PHOTO: Location: Rath Park, Franklin Square, L. I., N. Y. • Architect: Herbert D. Phillips
Consulting Engineers: Barstow, Mulligan & Vollmer

P&K CIRCLElux DAVITS & POSTS

modern lighting at a realistic cost

Here are two contemporary outdoor lighting installations – one an all new municipal swimming pool and recreational area – the other, a prominent New Jersey University. Both chose the P&K all aluminum CIRCLElux lighting package to illuminate and compliment their roadways, walkways, landscape and architecture.

The sweeping lines of the P&K CIRCLElux davit blend with the modern one story architecture of the Rath Park Swimming Pool. Yet, the modern, but stately, design of the P&K CIRCLElux post is in good taste with the traditional architecture of Fairleigh Dickinson University. The CIRCLElux lighting package is the correct low level lighting choice to compliment almost all types of architecture.

The P&K CIRCLElux is available in a wide range of davit styles and mounting heights. The post is available in one basic design but at various mounting heights and with the CIRCLElux you have a choice of three light sources – incandescent, mercury vapor and fluorescent. This combination of luminaires and davits or posts will enable you to specify "packaged" lighting units. This means easier specifying by using matched components which in turn can customize your lighting projects.

Send in your reservation now for the *new* CIRCLElux catalog.

P&K

PFAFF & KENDALL 84 FOUNDRY ST., NEWARK 5, N. J.

BRANCH SALES OFFICES: MIAMI, FLORIDA; BURLINGAME, CALIFORNIA
IN CANADA: POWERLITE DEVICES, LTD., TORONTO, MONTREAL, VANCOUVER
EXPORT REPRESENTATIVE: PHILIPS EXPORT CO., NEW YORK, N. Y.

Home Lighting

(*Continued from page* 135)

other well chosen and properly installed sources such as downlights, valances, and cornices. Thus the room can be made beautiful, showing off rugs, drapes and furniture to best advantage.

It has been demonstrated that with vigorous promotion the lighting load can be more than doubled. Experience has shown that when better lighting is installed, customers use it longer. Thus it isn't alone the "kw" that is important, but the "hr" is even of greater importance.

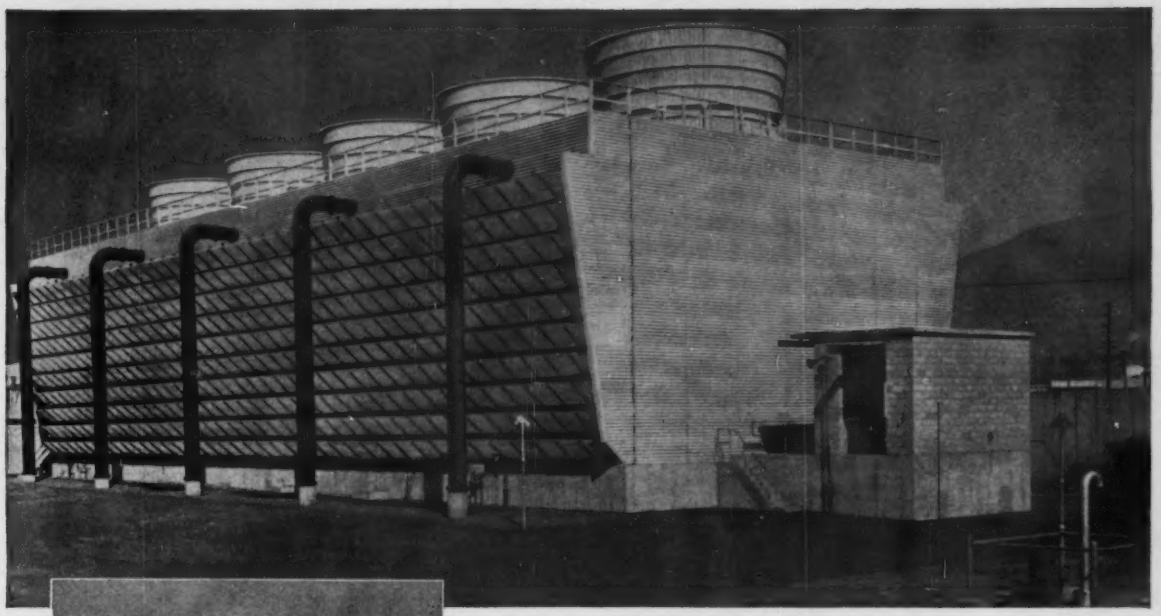
This perhaps can be explained by the fact that when poor lighting exists, it does not make much improvement when it is turned on. But good lighting on the other hand, is so pleasant and useful that it is appreciated and enjoyed. This again proves the value of utility promotion of home lighting.

Market Knowledge Essential

To carry on an effective home lighting program, those involved must have a thorough knowledge of lighting fundamentals, a full appreciation of the requirements of good home lighting as well as a comprehensive knowledge of the markets. Individuals must be able to make home lighting layouts, give lectures and make dramatic demonstrations. Every facet of the home lighting field must be contacted and kept informed of important home lighting facts. This would include department stores, lighting fixture stores, electrical distributors and contractors.

Tie-in could be made with Save Your Vision Week, Clean Up, Paint and Beautify Campaigns, and National Electrical Week. Sales floor displays can whet the passersby's interest for information on good lighting. Opthalmologists and optometrists should be reminded that our desire for better lighting is an important counterpart in furthering better and safer seeing.

Good home lighting does indeed possess tremendous potential for good building. Equally important is the utilities' responsibility to assist residential customers to apply the lighting knowledge which utilities now have so that this great field can be brought up to the standard of development of other lighting fields.



WAGNER® MOTORS HELP MARLEY TOWER

At work on the fan deck: Five Wagner Type EP, 75 hp, 480 volts, 1750 RPM Motors.

PRODUCE *MORE POWER* FOR BURBANK

This is the new Marley Class 600 Double-Flow 5-cell cooling tower at the power station of the City of Burbank, California ... the newest thing in cooling tower design. Its job: to cool water to get more kilowatts from steam.

Wherever water cooling is vital to plant capacity, product quality or customer comfort, chances are you'll find a Marley Cooling Tower. You'll probably find Wagner® Motors there, too. They're on this tower in Burbank, driving the huge fans used in the tower's cells.

The job is a rugged one. It calls for motors that can operate without attention month after month ... motors that can stand constant exposure to all kinds of weather and to high humidity, the number one cause of motor failure in cooling tower applications.

Wagner Type EP Motors meet these requirements. All vital parts of these workhorse motors are totally enclosed, and are sealed against moisture by a series of grease retaining grooves between shaft and housing. Running shaft seals, at both ends of the frame, prevent the entrance of water into the bearing housings. The frames, endplates and conduit box are made of heavy cast iron for extra protection against high humidity and corrosion.

What about your requirements for motor drives that must operate under adverse conditions? Versatile Wagner Totally-Enclosed Motors can meet them, whatever the application. They are available in standard ratings through 500 hp. Call your nearby Wagner Sales Engineer for full details, or write for Bulletins MU-224 and MU-230.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation

6458 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI

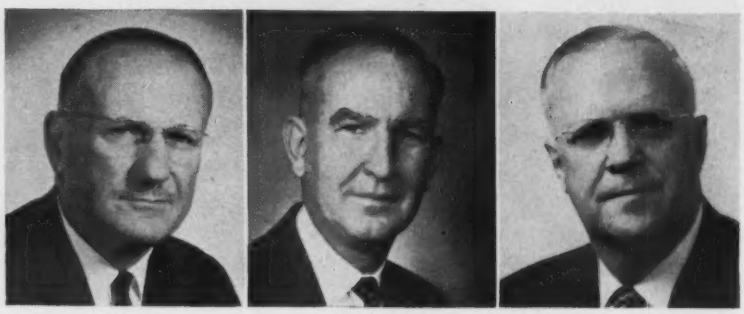
WH60-17

DP&L Names Hyer Chairman, Gardner President

Frank P. Hyer, president of Delaware Power & Light Co, has been named chairman of the board, succeeding Harvey H. Plank who retired. Austin T. Gardner was elected president. James W. Mackie has been made vice president in charge of accounting.

Harold W. Clift, vice president in charge of gas and electric operations, has been assigned the additional responsibilities for the company's construction program. William Hibbert was named secretary and treasurer; Henry J. Perkner, comptroller; William M. Gamble, assistant comptroller; and Joseph M. Regelski, assistant secretary and assistant treasurer.

Hyer joined Delaware Power & Light in 1947 as supervisor of operations. In 1953 he was elected vice president in charge of engineering, operations and construction, and in 1958 was made a member of the board of directors. He was elected president and general manager in April, 1959.



HYER GARDNER MACKIE

Gardner joined the company as secretary and comptroller in 1943. He was elected vice president and secretary in 1946. His first utility position was on the economic research staff of Utility Power & Light Co in Chicago, where he later became head of the budget department and then assistant to the president. He later became associated with the Utility Auditors and Tax Consultants and then the Associated Gas & Electric Co.

Mackie came to Delaware P&L in 1931 as assistant comptroller. He was elected comptroller in 1946.

McMurray Elected VP-Operations at St. Joseph L&P

W. K. McMurray has been elected vice president-operations of St. Joseph Light & Power Co. He has been assigned the operating responsibility for all production, transmission and distribution of the electric, gas, steam and water utility services of the company.

From 1930 to 1932 he was in the Henry L. Doherty utility training course at Public Service Co of Colorado. From 1932 to 1935 he did inventory and appraisal of utility property at St. Joseph Light & Power Co, Ozark Utilities Co, and Kansas City Gas Co. He then joined St. Joseph L&P in 1935 as an assistant engineer. He was an electrical engineer from 1938 to 1953, with time out in the service. He was then made manager of engineering in 1953. In May of 1960 he was appointed vice president-engineering.

Duke Power Co Elects Mattison a VP

Duke Power Co has elected G. G. Mattison a vice president. Appointed assistant vice presidents were Channing B. Brown, Charles B. Miller Jr, and Herman B. Wolf.

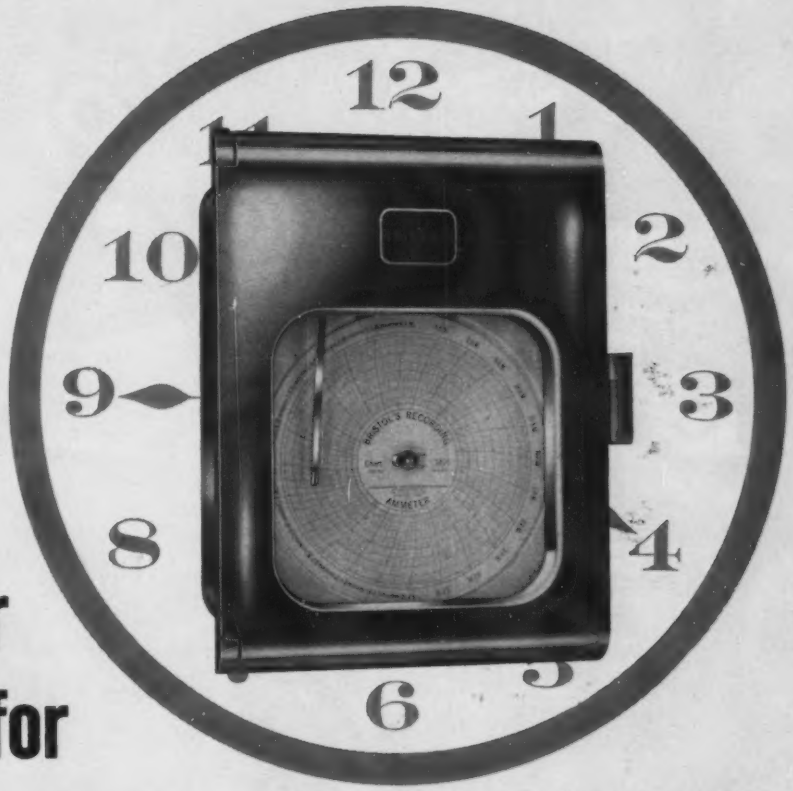
Mattison, who was formerly manager of production and transmission, joined Duke Power in 1924 in the electrical construction department.

He then served as switchboard and control crew foreman, field crew supervisor, and maintenance engineer. He was later made assistant suprintendent of electrical construction and maintenance before being named manager of production and transmission.

(*More News About People on page* 152)

11 big reasons for standardizing on Bristol Recording Ammeters:

1. Negligible temperature influence.
2. High accuracy: ±1% of scale.
3. High torque, keeps weight and power drain to a minimum, assures positive recording over full range.
4. Low electrical burden—only 5 VA at 5 or 10 amps.
5. High calibration stability. Seldom requires calibration.
6. Easy calibration in field. No special tools or skills required.
7. Rugged construction: Shock-proof ball-bearing movements; pen locking device for shipping or carrying.
8. Leveling not critical.
9. Up to 3 pens—for recording up to 3 independent readings.
10. ASA models available; Meet Specifications C39.2-1953.
11. Models for wall, switchboard, flush-panel, pole-mounting, portable and portable pole-mounting use.



The recording ammeter for 'ROUND-THE-CLOCK RELIABILITY

. . . it's a Bristol, of course . . . featuring time-tested moving-iron elements, refined and improved by Bristol R & D

Bristol recording ammeters give you maximum accuracy and reliability under field conditions—all the time.

Big reason is Bristol's ultra-reliable, moving-iron element—the same high-torque, low-burden element that has earned Bristol such a reputation for accuracy and dependability in thousands of installations . . . in electric utility central stations, substations, distribution systems . . . in industrial and process plants.

Bristol recording ammeters, while employing the ultra-reliable, time-tested moving-iron mechanism, incorporate basic improvements and design innovations which make them outstanding for accuracy, ease of calibration, and dependable operation under difficult conditions.

Models with up to three pens, actuated by independent elements, are available as are models for every mounting requirement, chart-drive requirement, or range requirement—all the features are detailed in Bulletin E1111. Write for your copy today. The Bristol Company, 116 Bristol Road, Waterbury 20, Conn. O.4

BRISTOL . . . for improved production through measurement and control

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

20 years beneath the sidewalks of New York

USS Tiger Brand Paper-Lead Cable

Like most utilities, Consolidated Edison of New York City, is engaged in an endless race to keep up with the growing demand for electric power.

In the Williamsburg section of Brooklyn, new USS Tiger Brand Paper-Lead Cables were installed to replace some of the existing ones that were being removed, due to system rearrangement, after 20 years or more of service. In some areas, the new cables were an addition rather than a replacement. The old cables were still giving good service but additional capacity was needed.

USS Tiger Brand paper-insulated, lead-sheath cables are noted for their reliability. More than 56,000 feet were used by Consolidated Edison in recent expansion programs. Engineering specifications called for 2/0, 27 KV, 3-conductor cable in carefully predetermined lengths for the Williamsburg section.

For high-voltage feeders, USS Tiger Brand Paper Insulated Cable is available in solid or gas-filled types. Many special constructions are available as standard production. An inquiry detailing your requirements will receive our prompt and careful attention. Write American Steel & Wire, 614 Superior Ave., N.W., Cleveland 13, Ohio.

USS and Tiger Brand are registered trademarks

USS Tiger Brand Electrical Wire & Cable —A standard cable for every special job

Asbestos Wire and Cable • Varnished Cambric Cable • Mold-Cured Portable Cord • Interlocked Armor Cable • Shovel & Dredge Cable • Special Purpose Wire & Cable • Paper & Lead Cable • Aerial, Underground and Submarine Cable

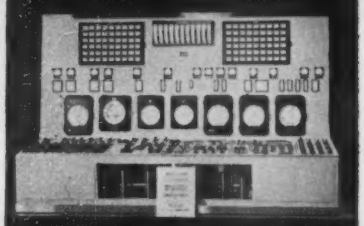
American Steel & Wire Division of United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors • Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors • United States Steel Export Company, Distributors Abroad

Power boost for Williamsburg area. Crew makes a 393-foot pull applying lubrication on the new Tiger Brand Cable as it is fed into the underground duct.

WHAT COMES UNDER

ENERGY CONTROL?



On paper it's just a phrase, but at work with you and your company it's important. Everything from fuel savings to calculating nuclear fuel costs comes under the heading of "energy control"—a subject of profit to you and your company.

Constant changes in the field make it imperative that you see such exhibits at the Power Show as temperature controllers, pressure and draft controls, liquid heat controllers and many others —PLUS a broad line of other power and allied equipment.

Only at the Power Show do you have the opportunity to investigate, compare and get the right answers, face to face, from the manufacturers themselves. Only at the Power Show can you see over 250 leading suppliers' products, all conveniently grouped together at one time.

Make sure you're there. Everyone else will be!

2523

24th NATIONAL EXPOSITION OF POWER & MECHANICAL ENGINEERING

AUSPICES ASME

NEW YORK COLISEUM

NOV. 28—DEC. 2, 1960

MANAGEMENT: INTERNATIONAL EXPOSITION COMPANY
480 Lexington Ave., New York 17, N. Y.

PERSONAL BRIEFS

The following personnel changes have occurred at Saskatchewan Power Corp: **E. R. Smith** is now chief generation design engineer in charge of the newly-formed Generation Design Division; **J. D. MacKay** is chief mechanical construction engineer, heading the newly-created mechanical construction department; **James M. McConnel** and **S. H. Bock** are electrical distribution superintendents at Regina; **Albert Hellyer** is the new project foreman, powerline light construction, powerline construction department; and **Howard Scrapper** has become administrative assistant to the assistant chief engineer of the Generation Design Division.

L. M. Welch, former assistant to the executive vice president, has been named general manager of operations of Gulf States Utilities Co. He assumes the duties of **George R. Fulton,** retired vice president and director of Gulf States.

Hector J. Durocher has been promoted to head of the Area Operations and Maintenance Division of Bonneville Power Administration. **Donald J. Harris** will succeed Durocher as customer service officer in the Spokane area office. Also, **Norman A. Gilchrist** has replaced **V. M. Murray,** retired, as Seattle area manager.

Long Island Lighting Co's new electric production manager is **John B. Peck.**

Howard E. Stites has been named manager of Central Illinois Public Service Co's electrical department. **Edgar E. Schmidt,** former substation engineer, will succeed Stites as electrical engineer.

Electro-Motive Division of General Motors has made these changes: **George D. Baker,** former assistant works manager, to manufacturing manager in charge of manufacturing operations; **John H. Anderson,** ex-director of test and inspection, to manager of manufacturing facilities; **Robert A. Stoddart,** former manager, branch operations, to manager production control; **W. N. Fritts,** ex-manager, production control, to manager, branch operations; and **H. D. Dana,** former assistant director of test and inspection, to manager, quality control.

Westinghouse Electric Corp has expanded its Total Electric Home program into a newly-formed organization, the residential marketing department, and its former manager, **William H. Loeber,** has been named manager of the new department. The following will become regional managers: **Francis X. Winn,** Northeast and mid-Atlantic; **John G. Adams,** Southeast; **Herman L. Wiler,** central region; **James K. Garvey,** Northwest; **Charles R. Beatty,** Southwest; and **J. G. McKinley,** Pacific coast.

Allis-Chalmers Manufacturing Co's West Allis centrifugal pump department and compressor department have been consolidated under the management of **E. F. Greiwe,** former manager of the Norwood, Ohio, Works centrifugal department. He is succeeded by **R. J. Dineen. C. F. Codrington** will be manager of sales and **H. L. Ross** manager of engineering in the new department.

The following promotions have been made at General Electric Co: **Lawrence H. Van Wassenhove,** advertising and sales promotion specialist, and **Stanley A. Gorski,** manager of marketing, both in the appliance control department, Morrison, Ill.; **Donald J. Harrington,** manager of marketing in the capacitor department, Hudson Falls, N. Y.; and **Guglielmo C. Camilli** has retired as supervisor of advance product engineering in the power transformer department.

Carl Selby has been promoted to Western regional manager in Portland, Ore., of Southern States Equipment Corp, assuming responsibility for its commercial and engineering activities in that area.

Lawrence A. Navarro is now manager of sales training at Line Material Industries. **Clifford E. Shaw** succeeded him as technical editor.

Vincent J. Biunno has been made manager of the news bureau of Worthington Corp.

OBITUARIES

William R. Bell Sr, 73, retired executive vice president, Gulf States Utilities Co . . . **K. M. Irwin,** 67, vice president in charge of engineering, and **Joseph M. Barnes,** 68, chief traffic engineer, Philadelphia Electric Co . . . **Gerhard J. L. Laubach,** 78, retired head of the merchandising services department, Northern States Power Co.

Ralph K. Evans, senior supervisor of law and claims department, Consolidated Edison Co of New York . . . **Nelson Hamilton Stewart,** 56, supervisor of cost reduction for Electronics Division, Westinghouse Electric Corp . . . **Thomas J. Hanlon,** 75, retired chairman of the board of Gulf States Utilities Co . . . **Julian King Sprague,** 57, president of Sprague Electric Co . . . **Harry J. Bauer,** 77, past president and board chairman of the Southern California Edison Co . . . **William M. Graham,** 58, founder of Graham Electric Co, which later became Boynton-Graham Electric Co . . . **Milward E. Grah,** 71, retired engineer for Toledo Edison Co.

Joseph N. Kelman, 86, former president of Kelman Electric & Manufacturing Co, now a division of I-T-E Circuit Breaker Co . . . **Herman L. Wallau,** 83, former designer of Cleveland Electric Illuminating Co power plants.

SALES ASSIGNMENTS

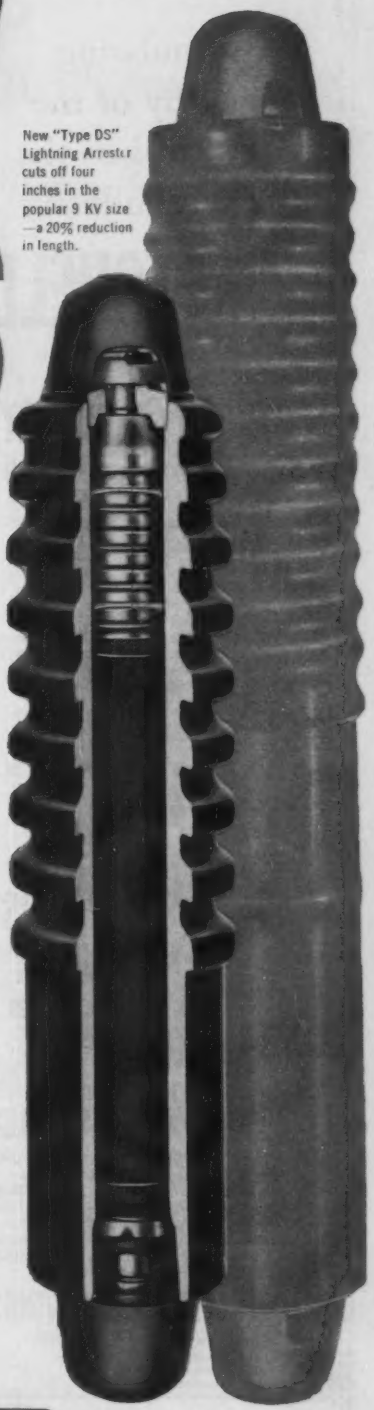
COMPANY STAFFS

Copperweld Steel Co has appointed C. A. Gunn to government sales manager. He will coordinate wire and cable sales to federal government agencies throughout the United States from headquarters at 140 S Dearborn St, Chicago, Ill.

General Electric Co has named James J. Farrell Southern regional sales manager of its distribution transformer department. William D. Trammell has been appointed sales representative for the Western district, silicone products department, Dallas, Texas. H. M. Carmichael and T. E. Traugott have been named zone sales managers for the insulator department. Carmichael will manage the Eastern sales zone which includes district offices in Atlanta, Baltimore,

NEW DS

DELTA-STAR CRYSTAL VALVE LIGHTNING ARRESTER



New "Type DS" Lightning Arrester cuts off four inches in the popular 9 KV size —a 20% reduction in length.

- 20% Shorter
- Balanced Design
- Easier to Handle
- Lower Discharge Voltages

The new "Type DS" Crystal Valve Lightning Arresters are shorter and lighter, for easier handling and installation. Size and weight savings have been achieved while keeping the "Balanced Design" which has made Delta-Star Crystal Valve Arresters top performers for thirty-five years.

For complete information on the new, easier-to-install "Type DS" Crystal Valve Lightning Arresters, write to *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 W. Fulton St., Chicago 12, Illinois.*

DELTA–STAR PORTER ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

A stimulating biography of the Henry Ford of the Electrical Industry

S.Z. MITCHELL

AND THE

ELECTRICAL INDUSTRY

By Sidney Alexander Mitchell

From 1885, six years after Edison lighted his first incandescent lamp, until his retirement in 1933, S. Z. Mitchell was as closely involved in the power industry as Henry Ford was in the auto industry. Now his son has written a biography of this dynamic man.

"Mr. Mitchell's own experiences in public affairs and in business during all of these more than forty years have enabled him to produce a significant volume." — HERBERT HOOVER. Illustrated with photographs. $5.00

Now at your bookstore

FARRAR, STRAUS & CUDAHY

NATION'S LARGEST

FEDERAL SAVINGS ASSOCIATION

pays you 4½% on savings

• 4½% current annual rate, dividends paid quarterly • World headquarters for the savings of 150,000 individuals, corporations and trusts in 50 states, 63 foreign countries • Same, sound management policies since 1925 • $35,000,000 reserves • Resources over $½-billion • Accounts insured by F.S.L.I.C. • Funds received by 10th of month, earn from 1st • We pay postage both ways

CALIFORNIA FEDERAL SAVINGS

WORLD HEADQUARTERS FOR SAVINGS

FREE! "California Here I Come!"—, latest issue on Golden State resorts, education, landmarks!

B-13

California Federal Savings & Loan Assn.
Box 54087, Terminal Annex, Los Angeles 54, Calif.

Please send "California Here I Come!" and Our Pot MAIL-SAVER* to:

Name _____

Address _____

City _____ Zone ____ State _____

☐ Funds enclosed in amount of $ _____

*Trademark

Birmingham, Boston, Charlotte, Chicago, New York, Pittsburgh, and St. Louis. His headquarters are in Atlanta. Traugott will head the Western sales zone covering district offices in Dallas, Denver, Kansas City, Los Angeles, Portland, and San Francisco, with headquarters in Burlingame, California. R. D. Hilley Jr has been named district manager of the new Birmingham, Ala., sales district serving Alabama, Louisiana, Mississippi and the northwestern portion of Florida. P. E. Jorgeson has been named district manager in the new Los Angeles sales district which includes Arizona and the southern sections of California and Nevada.

Allis-Chalmers Manufacturing Co has appointed Wilson O. Vaughn manager of the Baltimore district for the Industries Group, succeeding G. H. Carden who was transferred to the Richmond district as sales representative. Joseph M. Duncan has been named assistant general manager of the Washington, D. C., office.

Westinghouse Electric Corp has appointed Bruce W. Morrison sales manager for the Boston district office.

S&C Electric Co has named Fred A. Allehoff sales engineer for Oregon, Idaho, and Montana.

James R. Kearney Corp has appointed Jack Steinhauser district manager for the Texas and New Mexico sales territory.

Fanner Electric Manufacturing Co has appointed Paul Eldridge eastern regional manager.

Political Speakers Address PEA (*Continued from page 52*)

have no motive. Community leaders do not place a premium on higher education.

"Their system isn't as good as ours—but they are working at it a lot harder than we are," Litchfield concluded.

PEA President Walter J. Lyman reported progress in several areas by association committees and members. In commenting on the theme of the meeting, "Electric Power for Growth," Lyman reflected on some of the effects of growth on the electric power industry.

Making the assumption that there had been absolutely no growth in the electrical industry in the last 20 years, and that instead of selling six times as many kwhr, utilities were selling the same amount as 20 years ago and operating the same plants except for equipment replacement, Lyman said that in this event electric rates today would need to be nearly double what they now are to earn the same return on investment as that which was earned 20 years ago.

"Not only does an ample supply of electric power promote growth in our national economy, but this same growth makes it possible to supply the required power at much lower cost," Lyman pointed out.

For the coming year, G. R. Parry, Metropolitan Edison Co, was elected PEA's 53rd president, succeeding Lyman. Elected vice presidents were P. R. Lawson, Pennsylvania Electric Co; P. M. Alden, Philadelphia Electric Co; C. S. Bowden, Pennsylvania Power Co; and Managing Director F. H. Lichtenwalder.

Pennsylvania Electric Co was awarded a bronze plaque for the top award in the association's annual safety contest. Penelec had the lowest accident frequency rate among member companies working more than one million manhours annually. Its rate was 0.957 compared with an average of 3.07 for all competing companies in the state and a national average of 6.06 reported by the National Safety Council for electric utilities in the US in 1959.

Penelec also received three certificates during the contest year for one million or more manhours worked consecutively without a disabling accident. Philadelphia Electric received a similar award.

Pennsylvania Power Co received a certificate for the greatest reduction of its own accident frequency average based on a three-year record. Duquesne Light Co was awarded a certificate for the lowest number of lost-time shock and burn accidents per manhour worked.

Among utilities working less than one million manhours annually certificates were presented to Luzerne Electric Division of the United Gas Improvement Co, Cumberland Valley Electric Co and Home Electric Co for safety achievements.

PROFESSIONAL SERVICES

CONSULTING · DESIGN · EXAMINATIONS · APPRAISALS
CONSTRUCTION · PLANS · SURVEY · REPORTS

AMERICAN AIR SURVEYS, INC.

- Aerial Topographic Maps & Photos
- Plan & Profile for Transmission Lines
- Aerial Stereo-photos for Planning
- Topographic Maps for Reservoir Studies
- Coal Stockpile Volumes by Aerial Method

907 Penn Avenue — Pittsburgh 22, Pa.
Offices—Manhasset, N. Y.—Atlanta, Ga.

BLACK & VEATCH

Consulting Engineers

Water—Electricity—Gas—Sewage—Industry

Reports, Design, Supervision of Construction
Investigations, Valuations and Rates

1500 Meadow Lake Parkway Kansas City 14, Mo.

THEODORE D. BROSS LINE CONSTRUCTION CORP.

Steel Tower & Wood
Transmission Lines

Distribution & Maintenance

175 Endfield St. — Hartford, Conn.

BURNS and ROE, Inc.

Engineering and Design • Reports • Surveys
Construction • Electric, Steam, Hydro Plants
Transmission • Distribution • Aeronautical
Facilities • Research and Development • Nuclear,
Chemical, and Industrial Plants

160 West Broadway • New York 13, N. Y.

COMMONWEALTH SERVICES INC.

Management and
Business Consultants
360 Park Ave.
New York 22, N. Y.

ASSOCIATES INC.

Consulting and Design
Engineers
209 E. Washington
Jackson, Michigan

DAY & ZIMMERMANN INC.

Engineers

Design—Construction
Transmission—Distribution Lines
Reports—Valuations—Rates

New York · PHILADELPHIA · Chicago

DOBLE ENGINEERING COMPANY

Electrical Insulation Engineers

Field Testing and Maintenance of High Tension
Insulation, Special Problems in Electrical
Communications

Office and Laboratory: Doble Park
Box 344, Belmont 78, Mass. (6 miles from Boston)
Branch Office: 20 N. Wacker Dr., Chicago, Ill.

GIBBS & HILL, Inc.

Consulting Engineers—Designers—Constructors

Steam, Hydroelectric, Gas-Turbine & Nuclear
Power Generation—Electric Transmission & Distri-
bution Systems—Power Surveys, Reports & Con-
tracts—Industrial, Transportation & Communica-
tion Facilities—Water & Waste Treatment Works.

Pennsylvania Station — New York 1, N. Y.

WHEN TIME IS SHORT . . .

put the solution of your problems up to a specialized Consultant. His broad experience may save you months of costly experimentation.

GILBERT ASSOCIATES, INC.

Engineers and Consultants

DESIGN
SUPERVISION OF CONSTRUCTION
BUSINESS AND ECONOMIC RESEARCH
READING, PA.

Washington · New York

HARZA ENGINEERING CO.

Consulting Engineers

Calvin V. Davis · E. Montford Fucik
Richard D. Harza
Hydroelectric Plants and Dams
Transmission Line
Flood Control, Irrigation
River Basin Development

400 West Madison Street — Chicago 6

HOOSIER ENGINEERING COMPANY

Erection and Maintainance of
Electrical Transmission and Distribution Lines

1350 Holly Avenue, Columbus, Ohio

JACKSON & MORELAND, INC.

JACKSON & MORELAND INTERNATIONAL, INC.
Engineers and Consultants

Electrical—Mechanical—Structural
Design and Supervision of Construction for
Utility, Industrial and Atomic Projects
Surveys—Appraisals—Reports
Machine Design—Technical Publications

Boston · Washington · New York

JENSEN, BOWEN & FARRELL

Engineers

Appraisals—Depreciation Studies—Property Records
Cost Trends—Special Studies—Reports
for Rate Cases, Security Issues, Regulatory and
Accounting Requirements

Michigan Theatre Building Ann Arbor, Michigan
NOrmandy 8-7778

THE KULJIAN CORPORATION

Engineers - Constructors - Consultants

POWER PLANT SPECIALISTS
(Steam, Hydro, Diesel)
Utility • Industrial • Chemical

1200 N. Broad St., — Philadelphia 21, Pa.

PETER F. LOFTUS CORPORATION

Design and Consulting Engineers

Electrical • Mechanical • Structural
Civil • Nuclear • Architectural

First National Bank Building
Pittsburgh 22, Pennsylvania

CHAS. T. MAIN, INC.

Engineers

Electric, Steam and Hydraulic Projects,
Investigations, Reports, Appraisals
Design and Construction Supervision

Boston, Mass. — Charlotte, N. C.

PIONEER SERVICE & ENGINEERING CO.

Consulting and Design
Engineers—Purchasing
Specialists in Financing
Accounting and other Operations

231 So. La Salle St. — Chicago 4

SARGENT & LUNDY

Engineers

Consultants to the Power Industry

STUDIES • DESIGN • SUPERVISION

140 South Dearborn Street, Chicago 3, Ill.

TIPPETT & GEE

Consulting Engineers

Mechanical • Electrical • Thermodynamic
Structural Design • Studies • Supervision
Power Stations • Transmission • Distribution
Industrial Plants • Process

1333 North Second Street — Abilene, Texas
214 Meadows Building — Dallas, Texas

UTILITIES LINE CONSTRUCTION COMPANY, INC.

Construction and Maintenance

Transmission - Distribution
Electric and Telephone Lines
Consultants

565 York Road — Jenkintown, Pa.

VERNON GRAPHICS, INC.

VERNON GRAPHICS OF PA. INC.

CONSULTING AND SERVICING UTILITIES
ON MAPS, RECORDS AND FIELD INVENTORY

Mount Vernon, N. Y. MO 4-7117 | Norristown, Pa. Broadway 9-3000

A. W. WILLIAMS INSPECTION CO., INCORPORATED

Specialized Inspection Service

Poles, Crossarms, Lumber, Piles, Crossties
Preservative Treatment and Preservative Analysis
208 Virginia St., Mobile, Ala.
New York · St. Louis · Portland
Inspectors stationed throughout the U.S.A.

Knapp, Vennard Launch RMEL Denver Talks (*Continued from page 50*)

same time," declared Delmas Cathorne in outlining the philosophy of the Federal Reserve System's control of inflation.

Unequal productivity rates, he said, may justify wage increases in some sectors but not in others, yet where labor demands a flat wage increase, inflation control is made difficult.

J. J. Anderson, Westinghouse Electric Corp, drew attention to new words in the industry, such as thermoelectricity, ultrasonics, miniaturization, and electroluminescence. He described how thermoelectricity—an electronic process for removing heat—may change the design and application of appliances for the home.

Predicts Ovens

Electronic ovens, he predicted, will soon be on the market and within reach of the average family's pocket, and their principle may soon be applied to drying clothes in a minute. Electroluminescence, he added, offers opportunities for products besides those for home decoration, and miniaturization of control circuits will have many applications.

Anderson said that what is today considered the electrified home uses 8,620 kwhr and represents $1,975 in appliances at retail prices. Yet such appliances are only part of the list that could be used to add another 4,200 kwhr in consumption and $1,900 in appliance purchases. The truly total electric home, heated and cooled electrically, adds another 20,000 or more kwhr, he said.

Urges Public Relations

G. C. Rawls, Louisiana Power & Light Co, advocated a constant appraisal by utilities of their rating with the public and their own personnel. Changes of an economic or social character, he said, affect the public attitude toward a company. He enumerated among such changes the movement of businesses, the coming of shopping centers, traffic pattern changes, and especially process automation.

Employees, said Rawls, felt that jobs would be eliminated when his company began construction of a fully automatic steam plant. But the company has decided that the plant will start with a full crew and that slow adjustments would be made so that employees could be moved to other company activities.

Substituting for Titus G. LeClair, General Atomic Division, General Dynamics, Corwin Rickard brought RMEL up to date on progress in the experimental high-temperature, gas-cooled reactor project undertaken by some RMEL member companies. Construction will not begin until next year on the Peach Bottom 40-Mw prototype power plant for the Philadelphia Electric Co, although much of the research and development work is completed.

This project, he said, will generate steam over 1,000F by heating it with hot inert helium gas. The new reactor core uses graphite instead of metal, and the graphite, operating at a very high temperature, permits generation of more than 20 times more power per unit of core volume. Each graphite fuel unit will be capable of producing about 1-million kwhr, the equivalent of power produced by burning 375 tons of coal.

Power Economies Seen

Economic studies, he said, indicate that power can be produced at a cost of $232 per kw of capital investment, the overall power cost being 6.5 mills per kwhr. Smaller gas-cooled plants, developed from designs now made for ship compulsion, promise economical power generation in plants of a size needed for insolated communities. Such plants, he averred, might generate at costs less than 12 mills per kwhr.

Rickard also reported the direct conversion of heat of nuclear fission to electric energy without turbine-generator systems. His own organization accomplished this with the support of the Rocky Mountain Pacific Nuclear Research group of eight Western companies and San Diego Gas & Electric Co. Companies included PS of Colorado, Public Service of New Mexico, and Utah Power & Light Co.

A cesium cell thermionic converter, Rickard reported, produced 90 w of power directly from heat, the success of this process signifying that future experiments will establish the feasibility of this method.

Other prospects for "unconventional" power were described by James F. Young, General Electric Co. Deuterium and the tritium of the hydrogen bomb promise nearly inexhaustible sources of energy, although the first prototype fusion plants are at least 20 years away. Solar energy awaits a breakthrough in energy storage. Young also listed atmospheric energy, temperature gradients in the sea, tidal power, and geothermal power, and the harnessing of atmospheric electricity as other possible unconventional sources.

Among the many conversion experiments, those in the thermoelectric conversion of heat into electric energy, thermionic conversion, fuel cells, and MHD—the generation of electricity by forcing ionized gas through a magnetic field—were stressed by Young. But none of these, he said, has gone beyond the laboratory.

A luncheon session heard Maj Gen Edwin B. Broadhurst, Strategic Air Command, stress the urgency of scientific support of US defense measures. The time between warning and actual destruction from long-range missiles, he said, has been so compressed that the US "insurance policy," its air defense, requires a tremendous scientific effort to assure its ability to act promptly.

Today's estimate of a 15-min warning, he declared, must be continually re-examined with a view to defense operations being set in motion after shorter intervals. Noting that the SAC's mission is "to pose to any aggressor a risk in starting a war," Broadhurst declared that the one thing Khrushchev understands is strength.

"Lest you fear that SAC is enamoured of hardware," he said, "let me tell you that its key resources are its people and their talents and capabilities. We must obtain and retain people who make SAC a career and a profession."

Windber Cuts Rates

A seventh Pennsylvania utility, Windber Electric Corp, has agreed to reduce rates as a result of a state PUC investigation of its operations.

Effective Oct. 1, the utility lowered rates of 1,341 customers by $37,727, of which $32,445 is to be trimmed off bills of residential customers in the Windber-Paint-Scalp Level areas of Cambria and Somerset counties.

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

DISPLAYED RATE: ——RATES—— **UNDISPLAYED RATE:**

EMPLOYMENT OPPORTUNITIES: $25.50 per inch. Subject to Agency Commission.
EQUIPMENT & BUSINESS OPPORTUNITIES: $16.85 per inch for all advertising appearing on other than a contract basis. Not subject to Agency Commission.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.
EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

$1.80 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

PROPOSALS, $1.80 a line an insertion.
BOX NUMBERS count as one line additional in undisplayed ads

DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

Send New Advertisements to Classified Advertising Div. of Electrical World, P. O. Box 12, N. Y. 36, N. Y.

ADDRESS BOX NO. REPLIES TO: Box No. Classified Adv. Div. of this publication. Send to office nearest you.
NEW YORK 36: P. O. Box 12
CHICAGO 11: 520 N. Michigan Ave.
SAN FRANCISCO 4: 68 Post St.

POSITIONS VACANT

Electrical Engineer, Board layout work—power, lighting, and control systems; calculations; and occasional field contacts. Extremely wide variety of work with opportunity to enter consulting field and grow with progressive mid-western concern. P-4617, Electrical World .

Wanted sales engineer to cover Detroit-Chicago and Cleveland areas for manufacturer of truck mounted utility equipment. Must have sales experience in allied lines calling on telephone and electrical power companies. Some engineering experience necessary. Considerable travel. Salary open. Expenses paid. Airmail resume to Paul Cook, District Manager, Truck Equipment Company, 3963 Walnut St., Denver 5, Colorado.

Service Manager—Hospital equipment manufacturer needs man capable of developing and administering Service program, including training and supervision of men in installation, testing, servicing and repair of hydraulic and electrical equipment. Must be able to develop service literature and manuals. Residence in St. Louis area required. Send complete resume, including salary requirements to P-5463, Electrical World.

SELLING OPPORTUNITY AVAILABLE

Representative wanted for manufacturer of street lighting equipment pole line specialties. Western States. Full particulars. RW-5056, Electrical World.

EMPLOYMENT SERVICE

Salaried Personnel—$6,000-$30,000. This nation-wide service successful since 1927 finds openings in your field. Sells your abilities; arranges contacts. Address: Jira Thayer Jennings, Dept. E, P. O. Box 674, Manchester, Vermont.

U. S. Government

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-5422) will be received at Denver, Colorado, until 2 p.m., Mountain Standard Time, November 22, 1960, for furnishing, installing, and testing, two (2) 55,555-kva, 13,800-volt, 200 rpm, 60-cycle vertical shaft, hydraulic-driven generators for Trinity Powerplant, Central Valley Project, California. Installation is required within 1st unit—855 days, 2nd unit—735 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver, Colorado. Floyd E. Dominy, Commissioner.

Your Inquiries to Advertisers Will Have Special Value . . .

—for you—the advertiser—and the publisher, if you mention this publication. Advertisers value highly this evidence of the publication you read. Satisfied advertisers enable the publishers to secure more advertisers and—more advertisers mean more information on more products or better service—more value—to YOU.

TRANSMISSION TOWER LINE ENGINEER

Creative engineering graduate with electric utility tower design experience, to work on varied engineering problems, dealing with complete transmission line design layouts, estimating line costs, engineering-economic studies, and assisting in the specification and purchase of transmission line materials.

P-5475, Electrical World
Class. Adv. Div.,
P. O. Box 12, N. Y. 36, N. Y.

SWITCHGEAR ENGINEER

AGE: To 45 years

EDUCATION: B. S. E. E. minimum

EXPERIENCE: 5 years in 5 & 15 KV metalclad switchgear application; engineering background should include some design or development work.

Challenging Position—Unlimited Potential

Send Complete Resume

Including Salary Requirement

P-5357, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

ELECTRICAL ENGINEERS and DESIGNERS

Several openings available for electrical engineers and designers experienced in powerplant (preferably hydro) design. Salary commensurate with experience. Please send complete resume to Personnel Manager.

HARZA ENGINEERING COMPANY
400 West Madison St. Chicago 6, Illinois

WHO'S WHO in—
Electrical Equipment Representatives
Write for free copy of EERA Directory
C. W. SWARD, Executive Director EERA
1675 Fifth St. Clermont, Florida

FOR SALE

USED INDOOR OPEN TYPE SWITCHBOARD

Consisting of:

2—Westinghouse three phase induction regulators, five percent regulation, 364 KVA, 1000 amperes, 4200 primary voltage, automatic control.
2—Oil circuit breakers for above, double throw, mechanically interlocked, type "F11", 200A, 5KV, Westinghouse. (manually operated)
1—Switching reactor for above.
17—Westinghouse oil circuit breakers, three-pole, 7.5 KV, 400A, 50 MVA, type "F124" manually operated, 48 V.D.C. trip coil. Complete with operating handle thru switchboard.
17—Panels for above, complete with type "S" ammeter and voltmeter, three overcurrent relays, type "CO" one "OB" watthourmeter, two element, three current transformers, one three element ammeter switch.
17—Three pole disconnect switches, 400 Amps, 7500 V. single throw. Complete steel frame for switchboard and necessary copper bus runs.
4—Three pole disconnect switches, 600 A, 7500 V, double throw. Our drawing 54-10862.

To be seen completely erected at
CITY OF RIVERSIDE LIGHT DEPT., CALIF.
3854 Mulberry Street

To be sold complete or in parts

For information concerning equipment write or call

ERHARD BENDER
3854 Mulberry St. Riverside, California
Phone: Overland 6-7575

TRANSFORMERS

3—2500 KVA G-E 69000—2400/4160Y
3—2500 KVA G-E 69000—7200/12470Y
4—2500 KVA W-H 34500—2400/4800
3—1500 KVA G-E 69000—2400/4160Y
3—1500 KVA G-E 69000—7200/12470Y
4—1000 KVA Mol 7200/12470Y—4160
3—1000 KVA G-E 34500-7200/12470Y
6— 500 KVA G-E 34500-2400/4160Y
3— 500 KVA Penn. 13200-120/240
3— 333 KVA W-H 13200—2400/4160Y
3— 333 KVA GE 66000—2400/4160Y
3— 333 KVA Wag. 2400—120/240
2—1500/1875 KVA Mol. 3-Ph. 40,500—4800 F/C equipped
2—1500/1875 KVA Mol. 3-Ph. 34,500—2400 F/C equipped
2—1500/1875 KVA Mol. 3-Ph. 43800—2400/4160 F/C equipped

TRANSFORMERS WANTED

THE ELECTRIC SERVICE CO.
5316 Hetzel St.
Cincinnati 27, Ohio
47 Years' Dependable Service

Meetings Calendar

OCTOBER

National Rural Electric Cooperative Association—Region 6, Minneapolis, Oct. 31-Nov. 1.

Canadian Electrical Association—General and Sales Sections, Calgary, Oct. 31-Nov. 2.

NOVEMBER

Public Utilities Association of the Virginias—Accident Prevention Round-Table Conference, Roanoke, Nov. 2; Executive Committee, Hot Springs, Nov. 19.

• **Edison Electric Institute**—EEI-AGA Taxation Accounting Committees, The Cloisters, Sea Island, Ga., Nov. 2-4; Accident Prevention Committee, Statler Hilton Hotel, New York City, Nov. 14-16; Area Development Workshop, Park Plaza Hotel, St. Louis, Nov. 15-16; Commercial Cooking and Water Heating Committee, New York City, Nov. 16-17; Electric Space Heating & Air Conditioning Committee, Charlotte, N. C., Nov. 21-22; Electronics Seminar, Claridge Hotel, Atlantic City, Nov. 28-30; Street & Highway Lighting Committee, Cincinnati, Nov. 30-Dec. 1.

Pennsylvania Electric Association—Relay Committee, Hotel Brunswick, Lancaster, Nov. 3-4.

• **Southeastern Electric Exchange**—Directors' Meeting, Rocky Point Beach Motel, Tampa, Fla., Nov. 4; Sales Section Conference, Henry Grady Hotel, Atlanta, Georgia, November 16-18.

New Jersey Utilities Association—Annual Meeting, Seaview Country Club, Absecon, Nov. 9-10.

American Institute of Electrical Engineers—Power Industry Computer Application Conference, Chase Hotel, St. Louis, Nov. 9-11; Sixth Annual Conference on Magnetism and Magnetic Materials, Hotel New Yorker, New York City, Nov. 14-17.

• **National Electrical Manufacturers Association**—Annual Convention, Hotel Traymore, Atlantic City, Nov. 13-16; Annual Meeting, Savoy Hilton Hotel, New York City, Nov. 17.

Mid-America Electronics Conference—Hotel Muehlebach, Kansas City, Nov. 14-16.

Canadian Electrical Association—Engineering Sections, Western Zone, Saskatchewan Hotel, Regina, Sask., Canada, Nov. 17-19; General & Sales Sections, Western Zone, Palliser Hotel, Calgary, Alta., Canada, Nov. 21-23.

• **Tennessee Valley Public Power Association**—Distribution Practices Section Meeting, Andrew Jackson Hotel, Nashville, Nov. 18-19.

• **Electric Companies Public Information Program**—Inter-Regional Committee, Detroit Leland Hotel, Detroit, Nov. 22.

• **American Society of Mechanical Engineers**—Annual Meeting, Statler Hilton Hotel, New York City, Nov. 27-Dec. 2; 24th National Exposition of Power & Mechanical Engineering, Coliseum, New York City, Nov. 28-Dec. 2.

• Additions this week.

Advertising Index

Allis-Chalmers Mfg. Co. ..... 2nd Cover
35, 36
American Gage & Mfg. Co. 75
Anaconda Wire & Cable Co. 144, 145
Atlas Safety Equipment Co. 124
Auburn Machine Works, Inc. 128

Bartlett Mfg. Co. 102
Bethea Company, Inc. 113
Bethlehem Steel Co. 125
Biddle Co., James G. 124
Blackburn Corp., Jasper 115
Braden Winch Div. Motor Products Corp. 99
Bristol Company 149
Buffalo Forge Co. 10
Burndy Corp. 66

Cable Spinning Equipment Co. 124
California Federal Savings & Loan Ass'n. 154
Chance Co., A. B. 89, 106
Chapman Chemical Co. 107
Charles Machine Works, Inc. 92
Chase-Shawmut Co. 118
Clarage Fan Co. 27
Colorado Fuel & Iron Corp. 93
Copperweld Steel Co. 76, 77
Crescent Tool Co. 105

De Laval Steam Turbine Co. 8, 9
Delta-Star Electric Division H. K. Porter Company 153
Dice Co., J. W. 128
Directory of Engineers 155
duPont de Nemours & Co., (Inc.) Elastomer Chemicals Dept. 34

Eastern Gas & Fuel Associates 25
Elliott Company 6, 7
Engineers, Directory of 155
Epoxylite Corp. 129

Fanner Mfg. Co. 87
Fargo Mfg. Co., Inc. 71
Farrar, Straus & Cudahy 154
Flint Steel Corp. 81

Gai-Tronics Corp. 88
General Electric Co.
Apparatus Dept. 53, 54, 55, 57, 58, 59, 60, 61
Computer Dept. 23
Large Lamp Dept. 24
Graybar Electric Co., Inc. 109
Gulf Oil Corp. 136, 137

Haley & Co., R. G. 128
Heckendorn Mfg. Co. 98
Holan Sub. Ohio Brass Co. 119

I-T-E Circuit Breaker Co. Victor Insulators Div. 63
Irwin Auger Bit Co. 78
Island Creek Coal Sales Co. 138

Jackson Products. Air Reduction Sales Co. 106

KPF Electric Co. 32, 33
Klein & Sons, Mathias 70
Koenig Iron Works, Inc. 92
Koppers Co., Inc. Wood Preserving Div. 114
Kuhlman Electric Co. ..... 4th Cover

Lapp Insulator Co., Inc. 126, 127

Meter Devices Co. 109
Micro Balancing, Inc. 120
Minneapolis-Honeywell 121
Multi-Amp Electronic Corp. 102

National Electric Coil Div. McGraw-Edison Co. 101
National Exposition of Power & Mechanical Engineering 152
Nelson Electric Mfg. Co. 97
Newport News Shipbuilding & Dry Dock Co. 22

Ohio Brass Co. 19, 117
Okonite Co. 4
Olin Conductors Metals Div. 11

P-W Industries 102
Page & Hill, Inc. 80
Paranite Wire & Cable Div. Essex Wire Corp. 30, 31
Pennsylvania Transformer Div. McGraw-Edison Co. 72, 73
Pfaff & Kendall 146
Plymouth Rubber Co., Inc. 85
Powertron Ultrasonics Corp. 129

RT&E Corp. 14
Revere Copper & Brass Inc. 64
Reynolds Metals Co. ..... 3rd Cover
Riley Stoker Corp. 12, 13
Ripley Co., Inc. 109
Rome Cable Div. of Alcoa 91

S&C Electric Co. 110, 111
Sangamo Electric Co. 69
Searchlight Section 157
Sherman & Reilly, Inc. 98
Simplex Wire & Cable Co. 133, 134
Southwire Co. 26
Sprague Electric Co. 74
Standard Transformer Co. 28, 29
States Co. 104
Subox, Inc. 79

Texoma Enterprises, Inc. 96
Thomas & Betts Co., Inc. 123
Thompson-Ramo-Wooldridge Products 143
Truck Equipment Co. 103

United States Borax & Chemical Corp. 130
United States Steel Corp. American Steel & Wire Div. 150, 151
USCO Power Equipment Corp. 122
Utility Tool & Body Co. 128

Wagner Electric Corp. 147
Westinghouse Electric Corp. 20, 21

PROFESSIONAL SERVICES 155

CLASSIFIED ADVERTISING
F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES 157
EQUIPMENT
(Used or Surplus New) For Sale 157

easy to string

REYNOLDS 5005

high strength, all-aluminum conductor

This all-aluminum conductor is easier to string, easier to handle from storage to installation because it's light in weight—has no steel core. It is also easier to splice and eliminates chance of galvanic corrosion. 5005 aluminum alloy resists rough treatment and abrasion. Economical, too—costs less than any other conductor with comparable properties. Minimum guaranteed conductivity 53.5%. Complete data available from your nearest Reynolds branch office, Reynolds Electrical Distributor, or *Reynolds Metals Company, P. O. Box 2346-EL, Richmond 18, Virginia.*

Watch Reynolds new TV Show "Harrigan & Son", Fridays; also "All Star Golf", Saturdays—ABC-TV.

REYNOLDS ALUMINUM

Now from Kuhlman—

12% uprating OF ALL "POLE-TYPE" TRANSFORMERS

Featuring longer-life SPI-65* insulation with 65° rise

The new '60 dual-rated transformer includes an "ALL NEW" core and coil with better voltage regulation, more revenue per transformer, smaller, lighter, more efficient design.

Kuhlman transformers, known through the years for their high overload capacity, are now being uprated 12%. This means all "pole-type" ratings and medium power transformers through 10,000 KVA will have dual name plate ratings. For example, a transformer formerly rated 25 KVA provides 25 KVA performance at 55° temperature rise and 28 KVA performance at a 65° rise with no sacrifice in transformer life.

This uprating, which has been a performance fact for some time, is possible because of the excellent temperature rise characteristics inherent in all Kuhlman transformers. Now, longer-life SPI-65* insulation has also been added. The combination of inherent low temperature rise and SPI-65* provides both uprating and longer life to suit the loading practices that best meet your needs.

No longer is it necessary to choose between inherent thermal characteristics and super insulation. Kuhlman now offers both in one design. Ask your Kuhlman representative to show you why now, more than ever, your transformer dollar goes farther with Kuhlman.

*Licensed under Westinghouse Insuldur® patent rights.

KUHLMAN TRANSFORMERS

KUHLMAN ELECTRIC COMPANY, Birmingham, Mich.
Manufacturers of transformers since 1894
FACTORIES: Bay City, Mich. • Crystal Springs, Miss. • Salinas, Calif.